MAY 30, 1946

THE

Editorial Index, Page 29



# IRON AGE


# Hoskins Alloy Castings for Your Heat Treat Operations

When you talk about design and production of heat resistant castings, you're talking a language that Hoskins helped invent! For it was our discovery of the Nickel-Chromium alloys that formed the basis of the entire heat resistant casting industry.

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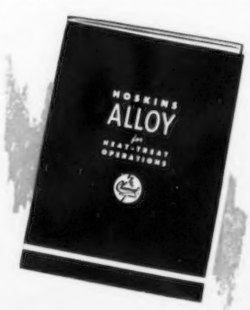


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THIS WEEK IN THE
# IRON AGE

Vol. 157, No. 22 May 30, 1946


# NEXT-DOOR service on steel

## *Quick delivery to your plant or job*

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# RYERSON STEEL

ESTABLISHED 1855

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May 30, 1946

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# *Innocents at Home*

MOST people over 40 years old have read the works of Mark Twain and it would not hurt the younger generation to read them also. For Samuel Clemens, better known by his pen name than by his real one, was a keen depicter of character, second only to Charles Dickens. Twain could puncture a stuffed shirt with a paragraph. Too bad he was born 50 years too soon to be able to set before us, in simple sentences, the ignorance, innocence or intent of those who today misrule and misguide America.

Mark's first book, and one of his best, is "Innocents Abroad." In it he relates the amusing adventures of a couple of naive Americans who are "taken for rides" in connection with a European tour. Mark and his companion could fall for most anything and usually did. But they alone were the victims of their innocence. That charming quality did not cause others to suffer.

I would like to have Mark Twain return to earth again, although he would probably be reluctant to do so, and write a book called "Innocents at Home." He would have plenty of opportunity to tear the shirts off a number of well meaning but naive politicians and administrators who in the professed endeavor to benefit the "peepul" are leading 130 million of them deeper and deeper into the mire of economic stagnation.

One of the first "innocents" that he would undertake to depict might be Senator Wagner, whose efforts to give more freedom to a minority have resulted in enslaving the majority. Perhaps he would go farther back than that and somewhat higher up and give some attention to the "great liberal" whose idea of giving union labor a gun for self defense has resulted in having it pointed at us in a nationwide holdup.

Undoubtedly Mark would have something to say about Economic Unstabilizer Davis, who started the race between wages and prices that is bound to spiral us out of competition for world trade with other nations. There was an innocent for you! How could he imagine that when he said that industry could afford to raise pay 50 percent without raising prices that the naive labor leaders would only demand 30 percent forthwith and be willing to settle for 16?

Mark would find some excellent material on innocents at home in the attitude of President Truman and Chester Bowles as to the "little bulge" in steel. They seemed to believe that appeasement at 18½¢ an hour and $5.00 per ton would leave everybody happy and willing to let things go at that. Of course the miners would not expect their leader, shaggy browed John, to do likewise or better for them, nor would the railroad unions and several hundred, or thousand others.

But I imagine that Mark for his chief innocents would choose you and me. And the rest of us 130 million Americans who so trustingly bought war bonds in the naive belief that the government would keep them "as good as gold." Well, after all, of what good is gold today since it has been put on the blacklist? After all, our bonds are only as good as the state of the nation and financially that is only as good as the buying power of the national income. And when that is being clipped on one end by industrial stagnation and on the other by inflation, we are indeed between the upper and nether millstones.

In the confusion of words and thoughts that encompass us today, how much we need another Mark Twain who can show us the truth and the way by exposing our fallacies and foibles!


# . . . with Inland 4-Way Floor Plate

Any step by an employee that results in a slip or fall has its effect on your profit. The most important movement in your plant is—Production Steps! Steps that must be protected.

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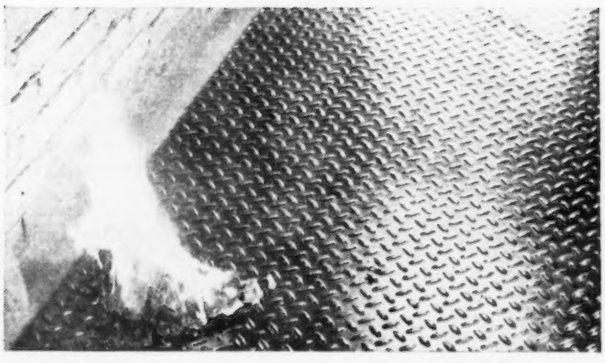
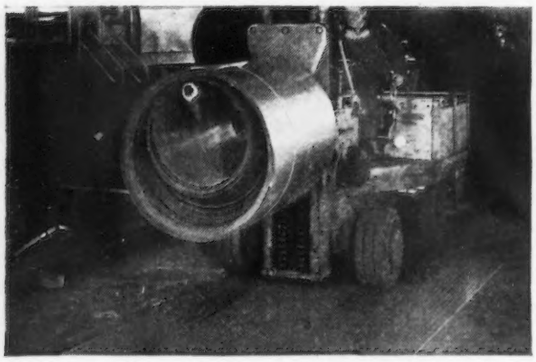


*Inland 4-Way is a protection against fire and heat—will not burn, warp or splinter. Cleans easily, drains freely, paints attractively.*



*Year after year, Inland Floor Plate carries heavy loads, stands up under the most punishing service.*

Made of hot rolled steel, Inland 4-Way Floor Plate practically eliminates maintenance—it won't burn, warp, crack, splinter or absorb liquids and odors. Easily installed and the essence of economy—once placed, Inland 4-Way Floor Plate is there to *stay!* Write today for your copy of the Inland 4-Way Floor Plate catalogue!

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# INLAND STEEL COMPANY

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► Reports of War Assets Administration for the month of April will show a drop in dollar volume in overall surplus disposal, the first decrease in five months.

Despite published rumors to the contrary and a distaste for the thankless job, Lt. Gen. Edmund B. Gregory, WAA Administrator, has no intention of resigning his task any time soon.

► It is estimated by the Army Quartermaster Corps that the cost of "spray packing" machinery is $25 per 100 sq. ft., exclusive of labor.

From Jan. 1, 1942, through Aug. 31, 1945, the War Dept. placed lump sum contracts with total contract prices of $131 billion, according to Under Secretary of War Kenneth C. Royall. He added that if all these contracts had been awarded at 1942 rates, they would have cost $154 billion.

► War bond redemptions have definitely leveled off. In fact, during the General Motors and steel strikes, redemptions in the Detroit and Pittsburgh areas did not rise above the national average.

Sales of war bonds for the first four months of this year indicate that sales will exceed redemptions by approximately $1,275,000,000 for the year. At present one fourth of the national debt is being held by 85,000,000 persons in the form of war bonds totaling $48.8 billion.

► Latest Lloyds Register shipbuilding returns indicate that over half of the world tonnage building is in British yards. This compares with a 1933-1938 average of slightly over 40 pct.

British shipping operators are complaining officially in regard to repair costs in British drydocks which they assert are at least 2½ times the prewar level. British shipowners are also troubled by the high cost of new building which is now over 75 to 100 pct higher than prewar levels.

► Box score of British housing progress shows 30,000 houses completed since the war, 84,000 under construction and 66,000 projected but not yet begun. These figures represent an increase during March of 6000 houses completed and 20,000 under construction.

The totals include 6000 permanent houses and 24,000 temporary houses completed, 65,000 permanent houses and 18,000 temporary houses under construction.

► Surplus property "fire sales" have begun in Europe with the slashing of list prices on jeeps, trucks and weapons carriers now rusting in OFLC depots on the Continent.

► Rehabilitation at the Petsamo nickel smelter in northern Russia is progressing, with production expected in July. A former Finnish power supply will be used.

► Rolls Royce gas turbine and jet propulsion aircraft engines will be built in China under license. Chinese engineers are in England for training at present, and British engineers will supervise construction of facilities in China.

► Soviet Scientific Research Institute of Metallurgy claims magnetic strength 15 times greater than that of tungsten steel for a new alloy "Magniko".

► British nuclear physicists are predicting industrial use of atomic power within the next 2 yr. Steam generation and air heating for gas turbines are considered the most likely first applications.

► Ministry of Labor statistics indicate the British unemployment is leveling off and not increasing.

► Over 2 million British workers have figured in wage increases since the first of the year. Increases are small in comparison to those in America.

The industries principally involved are heavy chemical, furniture, electric power, foundries, and loadstone quarrying.

► Steelworkers in Britain during the war sent nearly $1,200,000 to fellow workers in the Forces by a levy on their wages.

► Russian troops have recently occupied a metal-working plant in Vienna, posting guards over the exits. Russian authorities explain that the plants are regarded as reparations, and may be removed as German property.

► Miles Aircraft, Ltd., British producers have submitted a design for a jet mail plane to the postmaster in England. The design calls for cruising speeds up to 500 m.p.h.

► Freight rate boosts, immediate target of the railroads, will add leverage to long run decentralization of the steel industry. Even if water rates are raised proportionately, the dollars and cents advantage of vessel movement of steel will be increased, and lake and tidewater mills placed in a still more favorable position.

Short run effect of freight boosts will be to increase the mill net return of mills located closer to their major markets than to applicable basing points. Mills between the Mississippi and the Rockies stand to benefit particularly.

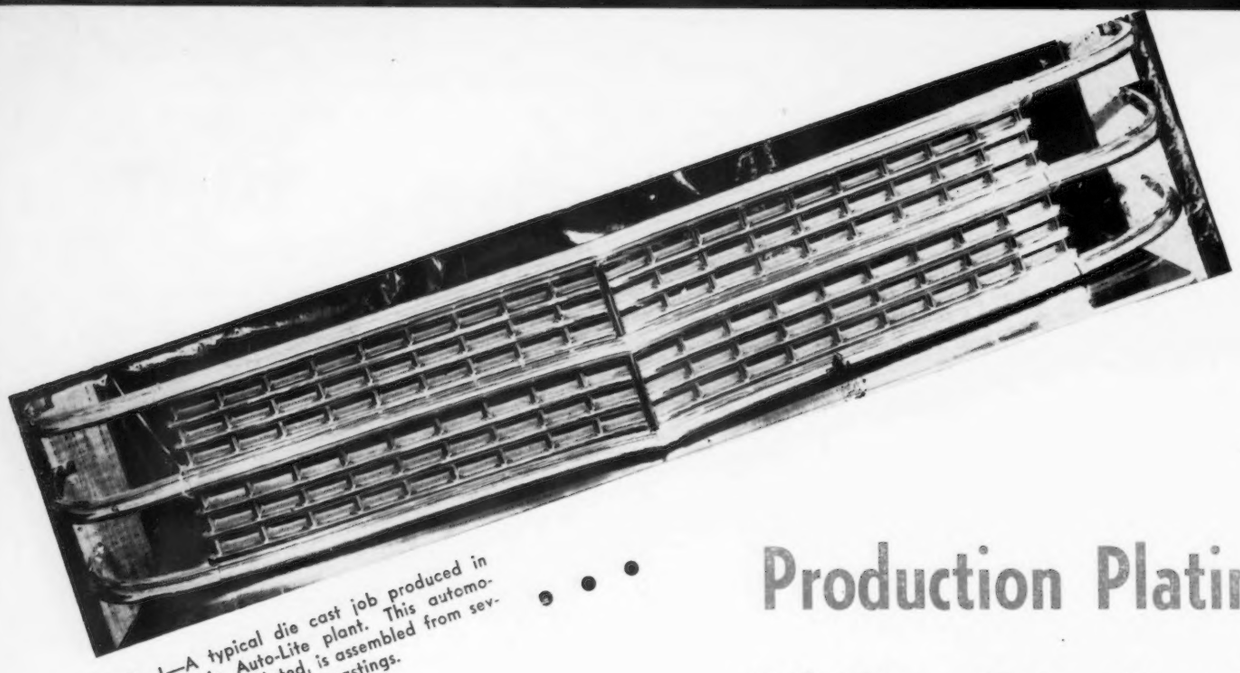

FIG. 1—A typical die cast job produced in the Electric Auto-Lite plant. This automobile grille, finish plated, is assembled from several zinc die castings.

# Production Plating Of Zinc Die Casting

***Bright copper-nickel-chromium plating of zinc die castings on a high production basis at the plant of the Electric Auto-Lite Co. is described herein. Solutions, current densities and conveying arrangements are discussed in considerable detail.***

By HERBERT CHASE

FEW finishes subjected to severe exposures are expected to retain so fine an appearance as long as those applied on automobile hardware and trim. A large proportion of these parts are die cast in zinc alloy partly because such castings lend themselves well to a plating that is both attractive and enduring. As the Electric Auto-Lite Co.'s Die Casting Div., Woodstock, Ill., is one of the largest producers of these castings, as well as of other die castings that require high grade plating, the plating installations in this plant are second to none in size and efficient operation. Fig. 1 shows a sample of the work performed in this plant —an automobile grille made up of several assembled die castings.

In earlier articles,[1] the methods and equipment used in producing, machining, polishing and buffing castings to be plated have been described. They are such that castings arrive at the plating setup with the surfaces to be plated smooth and buffed to the high luster required. Any castings that are unusually dirty or greasy are put through trichlorethylene degreasing before they are racked for plating. Castings arrive at racking stations either in tote boxes or via one of the chain conveyors that traverse the polishing and buffing departments.

Racking is done largely by women who hang racks from pipe supports until the racks are filled and then hang these on the chain conveyor that carries the loaded racks to the alkaline cleaning line. There are two major plating installations. One, used largely for radiator grille and other large castings, is in building 26[2] and the other in building 33.[2] The latter handles chiefly small and medium size castings but also plates large castings when conditions require this. As the two setups are substantially identical in essential operation, only that in building 33 is here described. This semi-automatic layout is supplemented by an auxiliary copper-nickel line which, except when other lines may be down temporarily, is used chiefly for parts requiring plating to different specifications than in the other lines. As the auxiliary line consists of individual dip tanks without an automatic conveyor, the cycle can be varied as desired.

Racking of castings follows conventional practice, the racks, of course, being adapted to the shape and size of part. In general, spring clips engage a cored hole or some projection that is concealed when the part is in service, but firm contacts are required.

A proprietary alkaline cleaner made by J. C. Miller is used at the first station on the cleaning line served by a short loop of monorail chain on which the racks are hung. This is possible because the cleaner is applied by spray under a 40 psi pressure as the racks are carried through a booth, as shown in fig. 2. The cleaner is kept at 160°F and is recirculated from tanks below the racks where grease and dirt are removed. High pressure of the spray provides a scrubbing action that helps to remove any dirt or buffing compound that may be lodged in recesses. Parts remain in the

[1] *This article concludes a series of three articles describing in detail operating procedures and equipment employed in the Electric Auto-Lite plant, the largest of its type in the country. The first article, published in* THE IRON AGE, *May 9, 1946, covered melting, casting, trimming and machining operations. The second article, published in the issue of May 23, 1946, covered polishing, buffing, tumbling and other steps preparatory to plating.*

[2] *The floor plan for this plant was published in* THE IRON AGE, *May 9, 1946.*

FIG. 2—Castings are shown here leaving the alkaline spray booth. Operator is transferring the cleaned casting to plating racks.

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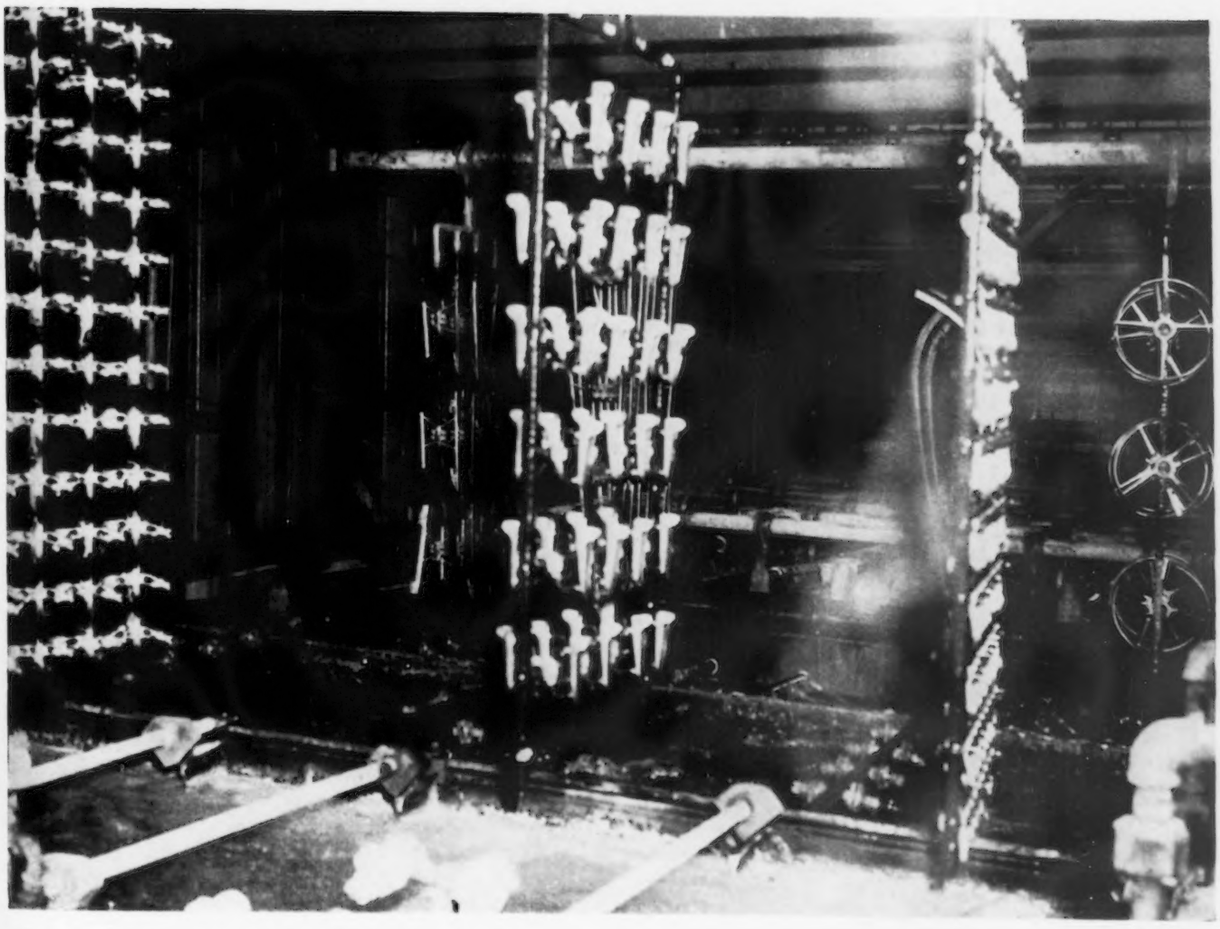
FIG. 3—A station on the automatic plating line where castings are rinsed after leaving the bright copper tank. Raising and lowering of racks is accomplished automatically.



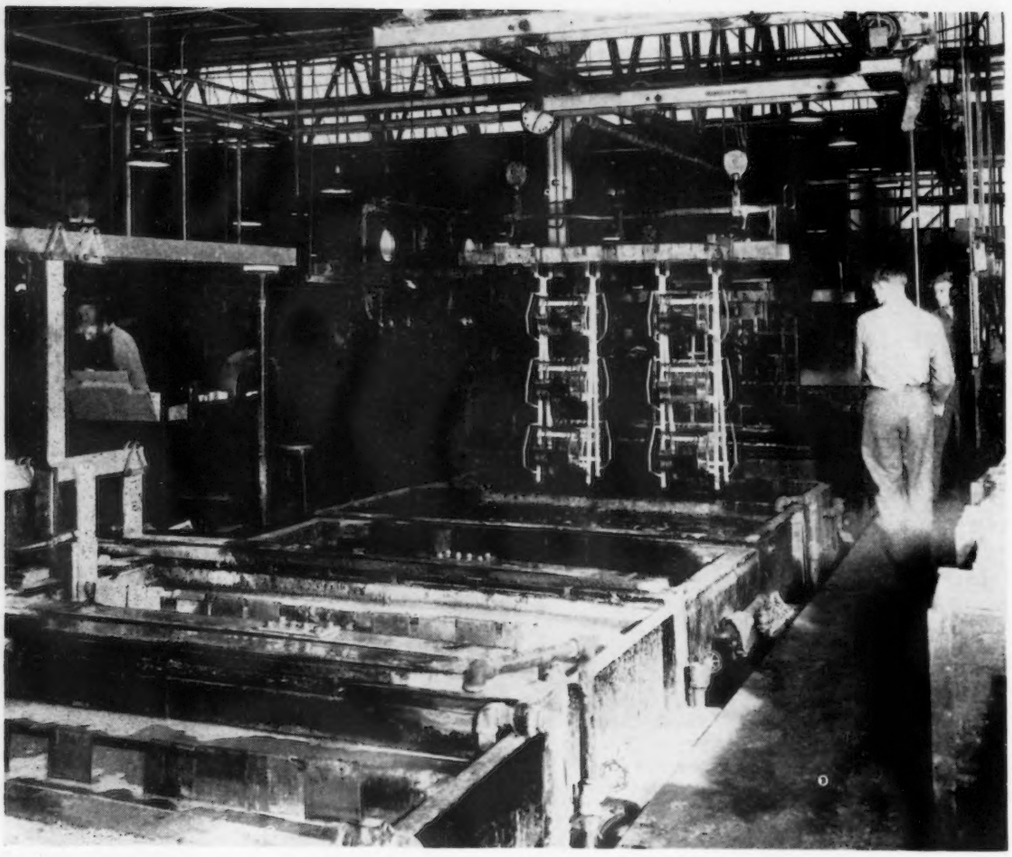


FIG. 4 — Chrome plating tanks for special plating jobs where the racks are walked by crane from tank to tank.

spray 2½ min and pass through a spray rinse of cold water before leaving the booth.

Racks of castings thus cleaned come out of the booth adjacent to the end of the copper-nickel line, are removed by hand and usually are hung directly on a bar of the Meaker conveyor that serves the plating line. There are, however, some pipe supports on which racks are hung temporarily if they issue from cleaning faster than the plating conveyor can be loaded. Loading is done at floor level but the bar conveyor rises immediately to lift the racks above the tanks in the plating line, as these tanks are completely above floor level.

Except for loading and unloading, the copper-nickel line is completely automatic, the conveyor performing all dipping and lifting operations and advancing the racks from tank to tank, as illustrated in fig. 3, as well as through the tanks. Timing is automatic as it depends on the speed of the conveyor which is set to suit the installation as a whole.

In the first tank, castings are carried through a No. 30 Northwestern alkaline cleaning solution at 180°F, with the work made the anode for 16 sec. Current density is 40 amp per sq ft. Cleaning is followed by a warm water rinse and next by a 15-sec dip in a 1 pct solution of sulfuric acid to slightly etch the surfaces.

Next, after a cold water rinse, the castings receive a copper strike in a conventional cyanide solution held at 120°F. This strike requires 2½ min at 20 amp per sq ft. Its purpose is to prevent immersion plating in the subsequent high speed copper solution, although the cyanide also acts, in a way, as a cleaner. If immersion plating were permitted, the copper plate would lack required adherence.

From the strike tank, the racks enter the DuPont high speed bright copper tank through which they are advanced for 15 min while plating proceeds at 40 amp per sq ft. The solution is held at 180°F and contains 12 oz of metallic copper per gal, plus the addition agent that acts as a brightener. Agitation is effected by recirculation, with the pump discharging through pipes under the cathodes and running the length of the tank. This plating results in a copper coating that has a minimum thickness of 0.0006 in.

Following the bright copper, racks are advanced through two cold water dip rinse tanks, the water being air agitated, and then through a cold water spray rinse. These rinses are primarily to prevent carrying any copper solution into the nickel plating tank. Before the castings enter the nickel tank, however, the copper plate is etched by a 15-sec dip in cold 1½ pct sulfuric acid solution.

Bright nickel plating is done in a Harshaw solution such as was used with success in this plant for many years before the war. The solution is held at 135°F and a pH 2.8. Current density is 35 amp per sq ft. It requires 20 min to apply the minimum thickness of 0.0006 in. of nickel specified.

Nickel plating is followed by three dip rinses in cold water after which the conveyor lowers the racks to floor level for unloading by hand and transfer to a chain conveyor that makes a loop around one end and two sides of the nickel tanks. On this conveyor, the castings are unracked and the racks continue around the conveyor to the opposite side of the tank where the racks are reloaded with castings to be plated. An entirely different set of racks is used for subsequent chromium plating.

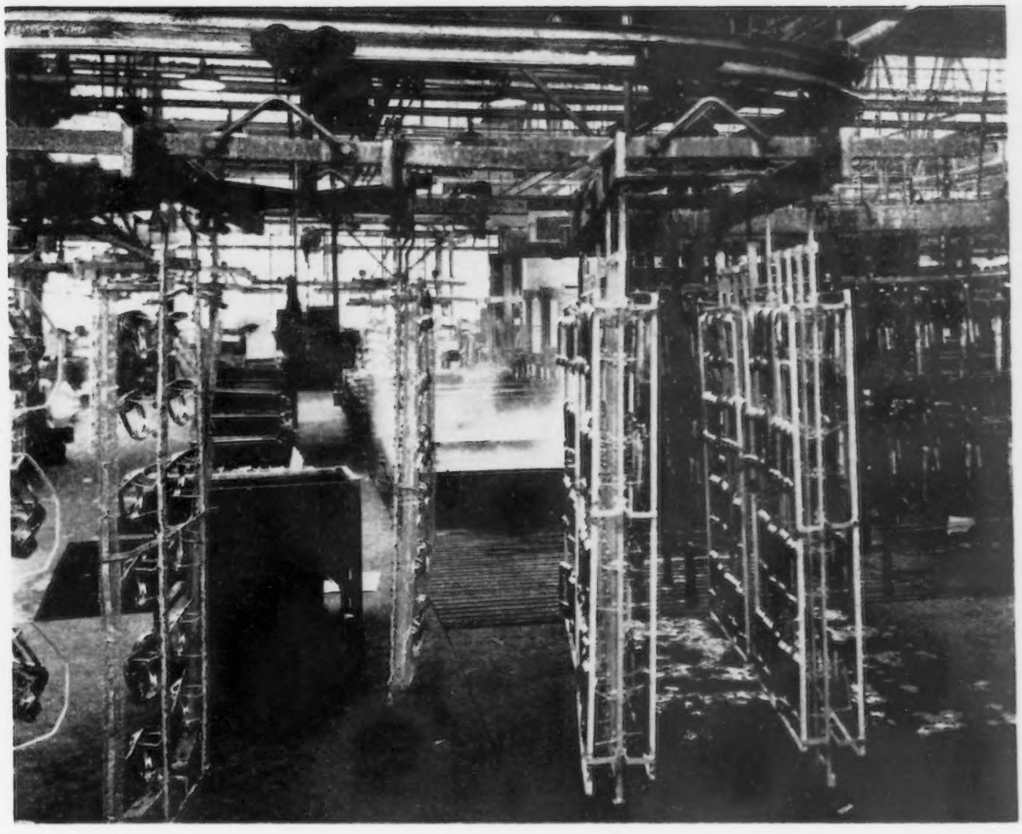


FIG. 5—End of the chrome plating line where frames carrying racks of plated castings are shifted to another line for packing or assembly. Empty frames are then returned to head of the plating line.

Although the nickel plated castings are generally bright enough to go directly to chrome plating, some do have dull areas that have to be buffed to required luster. This is done along a nearby belt conveyor, using conventional jacks with soft buffing wheels. These castings, along with those nickel plated that require no buffing, are delivered to an adjacent area where re-racking for chrome plating is done.

Chrome plating is performed on racks that have frames dipped in polyvinyl lacquer. These racks are "standard," that is, similar to those for copper-nickel plate, except that they are equipped with guards or "points" designed to prevent "burning" of the castings, especially at projections where, without the guards, the current density would be excessive.

As the chrome plating line involves only a dozen shifts, about half of which are through rinses and nearly all treatments are short, no automatic conveyor is used on the line. Instead, it is served by an electric hoist on a light crane which is walked by the operator from tank to tank, as shown in fig. 4. The tanks are set mostly below floor level but with top edges about 18 in. above the floor. Plating racks are carried on frames arranged for rapid shifting by the crane. Only at the chrome plating tanks is there any long dwell and there the operator drops each frame while he goes about shifting other frames. Before and after traversing the line, frames are handled on a monorail on which loading and unloading of racks is done.

At the first tank on the chrome line, frame loads of racks filled with castings are given a 1-min dip in a mild anodic alkali cleaner held at 140°F. Current density is 30 amp per sq ft. This cleaner removes any compound left from nickel buffing and is followed by a quick dip in an activator solution containing 8 oz of sodium cyanide per gal of water.

After a spray rinse, controlled by a pedal valve, the castings receive an in-and-out dip in a 5 pct solution of sulfuric acid, which has a slight etching action. Another spray rinse follows this after which the parts are chromium plated in a solution containing 50 oz of chromic acid per gal. This solution is held at 114°F and the current density ranges from 150 to 300 amp per sq ft, depending upon the parts being plated.

For this plating, there are three 1000-gal tanks. No agitation either of the solution or of the work is required. After plating, the parts are dip rinsed in a recovery tank, the contents of which are used in making up new plating solution. This is followed by a cold water spray rinse and then by a short dip in an air agitated hot solution containing 2 oz of soda ash per gal, that neutralizes any traces of acid remaining on the castings. Finally, there is a cold water spray and then a dip rinse in air agitated hot water which leaves the castings clean and warm enough to dry rapidly as they are carried on the monorail, fig. 5, to the unracking station.

The auxiliary plating line is also equipped with an electric hoist on a walking crane for handling frames along the dip tank line. Castings handled there are chiefly those for indoor applications in which the heavy plating specified for exterior automobile hardware is not required.

After plating is completed, all parts undergo exacting inspection before being shipped or sent to other operations. Where any defects discovered can be corrected, this is done without stripping, if possible.

Otherwise the castings go through a stripping tank and are replated.

Many of the castings plated have recesses for stripping or for filling in certain areas with enamel to contrast with the bright plating. Such work is done with stripping "pencils" or by spraying through masks that cover such areas as are to remain bright. It is also specified that the back faces of some plated grilles be enameled, a job that is done by spraying from the back without masks but at such angles that front faces remain free of the enamel.

All such work is done in spray booths or at benches in a paint area, using special enamels that adhere well to the plated surfaces. Often some wipe-off is required on surfaces that must remain free of enamel but, with proper care, such work is minimized.

For drying enamels and improving their adherence, the parts receiving them are put through a drying oven where they commonly remain 1 hr at 250°F. This temperature is sufficient for proper drying but does not cause the blistering of plating that sometimes results when a higher baking temperature is used.

In an area adjacent to that used for painting, many castings have fastening studs screwed into holes cored and tapped for this purpose. Other assembly work, as the building up of certain radiator grilles made in several pieces, is also done here.

There is, of course, a large area devoted to packing and shipping. Most packing is done either in individual cartons or in cartons having separate cells so that marring in shipment and handling is avoided.

# Hot Extrusion of Steel Pipe

PRACTICE of the Mannesmann Co. at Witten, Germany, in the production of steel pipe of the type normally used for gas, water and steam piping is to extrude blanks in a vertical press. Information with respect to the practice followed, and tools, dies and containers used, has been reported by Sam Tour, Tour & Co., Inc., New York, in a Joint Intelligence Objectives Agency report.

For a 1250-ton mechanical press, a 7.48-in. diam billet is used, which has been preheated to 2280° to 2320°F. Billets from the furnace are descaled by mechanical methods in a special rolling machine, which also produces some elongation and sizing of the billet. In regular production, approximately 120 to 180 pressings can be made per hr with best production averaging 150. Each billet weighs approximately 66 lb and is handled by hand. The process has been used to produce stainless steel pipe as well as plain steel pipe. When stainless steel is to be produced, the billets are heated in containers so as to avoid scaling, with a total of 14 men required to handle the furnaces and presses. The extrusion speed is 16.5 in. per sec, independent of tube size being extruded. Minimum wall thickness of tube extruded is 0.0787 in. and maximum is 0.2362 in. The principal problem of production is that of maintaining concentricity. The smallest tube produced is 1.535 in. outside diam with 0.0787 in. wall. Tubes up to 2 in. in diam are regularly produced. It is claimed that mechanical extrusion presses are much more satisfactory than hydraulic presses.

### Die and Tool Steels

The container in which the steel is heated, is made of three parts—the main block, an intermediate liner and an inner liner. The main block is the usual forged or cast steel of a strength of about 114,000 psi. The intermediate liner has a wall thickness of about 1.575 in. and is set in place with a shrink fit from 390°F.

The inner liner is made from a pressed and drawn cup produced from a cast billet of WP steel, which is reported to contain 0.4 pct carbon, 0.8 pct silicon, 0.5 pct manganese, 1.1 pct chromium, 0.13 pct molybdenum, and 3.6 pct tungsten. The cast billet is heated to 2010°F and pressed and drawn to form a cup from which the liner is cut (it is claimed that this produces a better liner than a full forged liner). After machining to a wall thickness of about 0.9842 in., the liner is heat treated by an oil quench from 1830°F and a draw at 1110°F for 2 hr at heat. The life of the liner is claimed to be about 6000 pieces with an average of 800 between each machining operation. It was reported that a vanadium addition to this steel was tried but that no advantages were found.

Dies are reported made with steels of the following composition: 0.44 pct carbon, 1.8 pct silicon, 0.85 pct manganese, 14 pct chromium, 6 pct nickel, 2.5 pct tungsten, and 0.77 pct vanadium. Use of 6 pct nickel is reported to give as good results as when 14 pct nickel is used. This is an austenitic steel (only austenitic steels are considered satisfactory) and it is claimed that the dies of this steel are good for 40 pieces of thin wall pipe and up to 300 pieces of thick wall pipe. This steel is reported easy to machine and superior to any other steel found to date for the purpose.

### Composition of Mandrels

Mandrels are made of a steel containing 0.27 pct carbon, 0.2 pct silicon, 0.23 pct manganese, 1.7 pct chromium, 4.4 pct nickel, 0.46 pct molybdenum, 5 pct tungsten, and 0.58 pct vanadium. The entire mandrel, however, is not made from this composition—only the core is made of this composition and it is surfaced by being given a weld bead coating to finish 0.1575 in. thick of the composition of steel used for liners (referred to above). The welding is done by electric arc means on a lathe where a single bead is applied and then the product is machined. After machining, the material is heat treated by oil quenching from 1830° to 1920°F and drawing at 970° to 1020°F. The weld metal layer left after machining is 0.0984 to 0.1181 in. thick. The mandrel has a life of 200 to 250 before redressing and an additional life of 100 and 250 pieces after redressing.

The ram is made from a steel as follows: 0.32 pct carbon, 0.24 pct silicon, 0.37 pct manganese, 2.13 pct chromium, 0.05 pct molybdenum, 9.7 pct tungsten and 2 pct cobalt. This steel is heat treated by oil quenching from 1830° to 1920°F and drawing at 1075° to 1110°F.

# LeBlond Resumes Production of Crankshaft Lathes

PRODUCTION of automatic crankshaft lathes by the R. K. LeBlond Machine Tool Co., Cincinnati, interrupted during the war, has now been resumed. The new LeBlond line is said to be more automatic and much faster than the models produced before the war.

Although there is some overlapping of functions, the four machines in the series complement each other and represent a rounded line of automatic crankshaft lathes that perform all turning operations such as rough and finish turning, filleting, cheeking, and shaving.

The model 6AC is a two-spindle machine, built for simultaneously rough turning pin bearings on both spindles, or simultaneously finish turning pin bearings on both spindles. Drive is from both ends in hydraulically operated pot type chucks. Two master crankshafts, enlarged duplicates of the crank to be machined, pattern the movement of the tools through the cycle of rapid traverse to start of cut, feed movements to the sizing stop, and rapid return to starting position. Predetermined design of the cam allows variation of feed on any part of the cut. Equipped with dynamic reversing switch for automatically stopping the spindle at any predetermined position, and having the control circuit interlocked with the chucking valve, this machine has an average production 30 to 50 cranks per hr.

Model 7ACL has a single or double center drive for rough turning all line bearings in one operation. The driving head and tools, and mechanical feed are electrically powered, and dwell is provided at the end of the cut to remove rough tool marks. Equipped with air operated carrier crane for handling of crankshafts in and out of machine, it will produce an average or 15 to 25 cranks per hr.

The model 1LB is a single spindle, either single or double center drive lathe, with separate sets of tool units for simultaneously rough and finishing turning all line bearings, flanges, and stub ends of crankshafts. Two sets of oppositely moving cutting tools rough out all line bearings, followed by another set of finishing tools on a separate tool unit moving in from a third direction for finishing previously roughed-out surfaces, so that there is no loss of time between roughing and finishing operations.

The finishing tool unit provides positive, smooth dwell of predetermined duration for sizing the work, contains the coolant system and acts as a chip guard and apron for protection of the operator. The lathe is powered by combination electric-hydraulic motor units. Its average production is 12 to 20 cranks per hr.

Model DM is a four-station indexing machine built on the revolving drum principle for finish turning of line bearings. It eliminates completely all rough grinding operations. The addition of the fourth station, the loading station, makes possible continuous uninterrupted operation of the machine without time formerly lost for loading and unloading. The lathe is powered by combination electric hydraulic motor unit. A large number of separate cutting operations are combined in a complete cycle, thereby increasing the productive capacity of the lathe to an average of 30 to 40 cranks per hr.

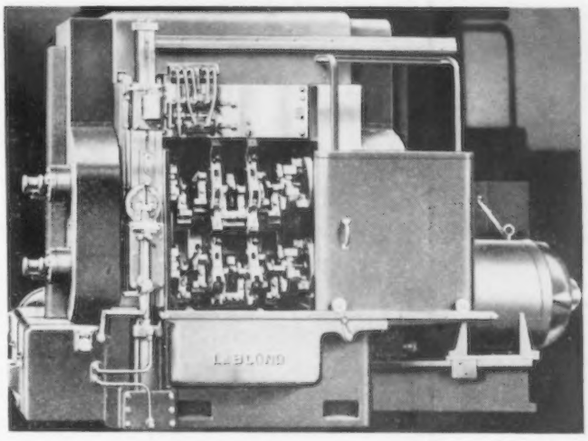



FIG. 1—For rough and finish turning all pin bearings, this automatic crankshaft lathe is designated model 6AC.

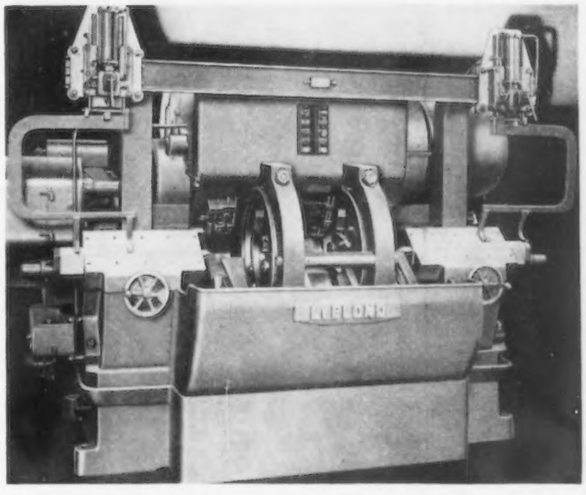



FIG. 2—LeBlond model 7ACL is designed for rough turning all the line bearings of crankshafts.

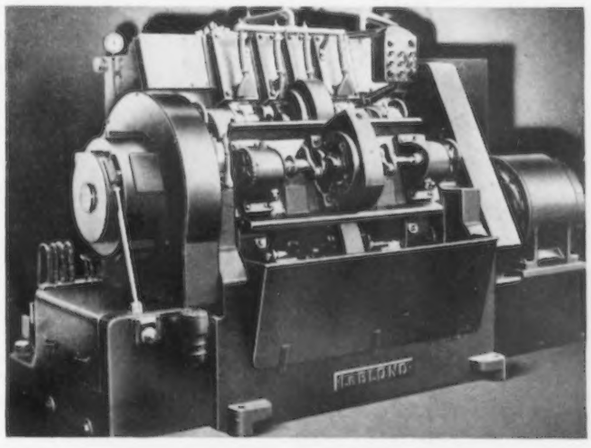



FIG. 3—Model DM is a four-station indexing machine of the revolving drum type for finish turning crankshaft line bearings.

# Applying Motion Study To Aircraft Assemblies

By F. C. BAILEY
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***Application of motion study to short run assemblies in a British aircraft plant is described in this article. The author outlines the principles of motion study, a technique heretofore associated primarily with mass production operations, and cites examples of its use in speeding production of short run assemblies.***

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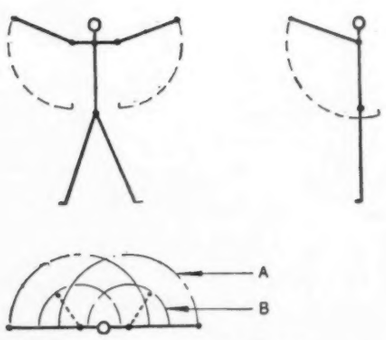


FIG. 1—Areas of reach of the arms. *A* indicates maximum reach; *B* indicates easiest reach.

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ALL physical work involves movement and therefore can be studied with a view of improving its movements. The credit for most of the pioneer work and original research in the direction of economizing on the labor "power" of a worker goes to Frank B. Gilbreth, an American engineer who in 1885 commenced a scientific investigation into the movements involved in bricklaying, and after some considerable success began to apply the principle of scientific method and measurement of movement to other fields of activity.

It is not possible to compile a simple list of "do's" and "dont's" for the application of motion study to aircraft engineering because, except in the case of a very simple job, most studied assemblies become a complex compromise between various principles of motion economy and practical and economic necessities. These conditions are determined by such factors as existing shop facilities, quantity to be manufactured, flow of raw material and parts, but the main principles as

*This article is reproduced from "Aircraft Production," London.*

distinct from any rigid formula can be summarized in the following manner:

(1) *Minimum length of movement.*—The fulfillment of this requires material and tools be placed in the areas of easiest reach (see fig. 1).

(2) *Least change of movement direction.*—When the arm changes its direction of movement, time and energy are wasted in accelerating, then decelerating for the change followed by a further acceleration. It is therefore necessary that material and tools be so arranged that the minimum change in direction over the whole movement sequence occurs. As an illustration see fig. 2. This does not represent an actual assembly; its purpose is only to illustrate the principles of minimum change of direction and minimum length of movement.

The cycle really starts by removing two finished assemblies from the fixture and dropping them down the finished-part chutes into boxes. A screw is then grasped in each hand from the tray in front of hopper *A* and pushed through a thick, plain washer on rubber mat *B*, while being retained with the index finger of each hand. The same is done on *C* and *D*, a nut picked up from *E* and the screw assembly palmed while the nuts are loaded into the fixture. Both screw assemblies are then started in the nuts and operated by overhead-shielded Yankee screwdrivers, after which the finished assemblies are removed from the fixture. The second cycle then begins by the dropping of the two assemblies down their respective finished-part chutes and so on. In most cases the arrangement of material and tools in the horizontal arc of area of easiest reach has the biggest field of application.

(3) *Symmetrical Movements.*—If the right arm is stretched out sideways while the left remains at the side of the body, muscles in the left-hand side of the body come into play to maintain trunk balance. If this is done repeatedly, say, once a second, the quickness required for muscular alteration will cause excessive fatigue and a tendency to lose balance in the direction of the unbalanced movement. If both arms

perform the same movements in equal and opposite directions balance is maintained without the use of body muscles and there is less fatigue.

There is always a natural tendency for both hands to do similar things. For instance, in trying to unscrew the top on a tight jar, both hands tend to twist in opposite directions. In the design of work method and work-place layout, every effort should be used to make it possible for both hands to work simultaneously in equal and opposite directions (fig. 3).

(4) *Symmetrical Movements Must Be Simultaneous.*—There is little real advantage in both hands working if the movements are not simultaneous. It is a common sight to see an operator's left hand waiting while the right hand performs a given movement and then to see the right hand waiting while the left picks up a part or tool. Even if the advantage of balanced movements in reducing fatigue is disregarded, it remains obvious that if both hands can work simultaneously nearly twice the quantity of work is performed, although it must be remembered that unless both hands are performing similar movements the operation is difficult and consequently less productive.

(5) *Natural Movements.* — It is unnatural for the hand and fingers to perform an operation with the palm of the hand facing up instead of downward. It is equally unnatural to push objects across in front of the chest instead of pulling them. Unnatural movements should be avoided.

(6) *Rhythm of movement.* — If the five principles stated above are put into practice the work cycle should have a pleasing rhythm. By this rhythm, mental irritation and frustration caused through unstandardized sequence of movement and undetermined position of small tools are eliminated.

(7) *Development of Habit.*—A marked characteristic of human nature is the tendency to form habits. Complete habitual performance of a given piece of work is only possible under standard conditions. The principles of motion economy set out above secure these standard conditions. After an operator has worked for a little while under motion-study conditions, it is interesting to note his tendency to make simultaneous movements with both hands even when engaged on work that has not been studied.

(8) *Choice of parts handled.*—The choice of parts to be handled can be a major consideration. Folland Aircraft, Ltd., has found it economical from a motion study point of view to nest unsymmetrical parts and handle as far as possible only symmetrical parts.

Fig. 4 is an example in part-handling choice. To fulfill the other principles, it will be necessary to nest either the bolt or the wing-nut. The apparently natural decision, based on traditional experience of designing the most easily manufactured tool and disregarding the movement, will be to nest the regular shape of the bolt head, leaving the wing-nuts to be handled. From a handling point of view, however, the difference in dimensions *A* and *B* on the bolt head, fig. 4, is negligible, and this, therefore, should be the part that is handled. The resulting application of the principle is the nesting of the wing-nuts and handling of the bolts.

The fact that the methods of motion study are so little used in the British aircraft industry is probably due to the misunderstanding of its possibilities. Motion study has received widespread notice through the British electrical industry, in which the greatest proportion of motion-study engineers are employed. This close connection has given rise to the belief that only industries similar to the electrical industry are suitable for the practice of motion study. The manufacturing differences between aircraft and electrical accessories are no doubt great, but an understanding of the fundamental differences will allow a successful

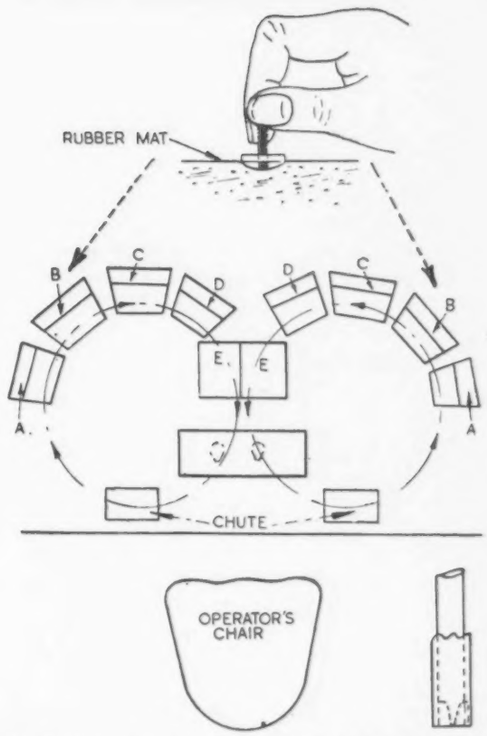
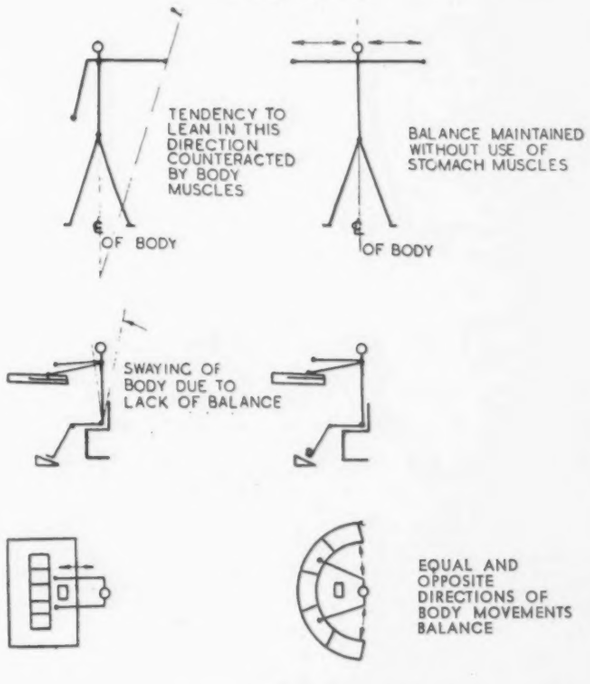



FIG. 2—Arrangement of components to require the least change of movement direction in assembling the screw and washers shown in the insert. Method of using rubber mat to place washer on screw is also illustrated.

FIG. 3—Work layout should permit both hands to work simultaneously in equal and opposite directions to provide for body balance.



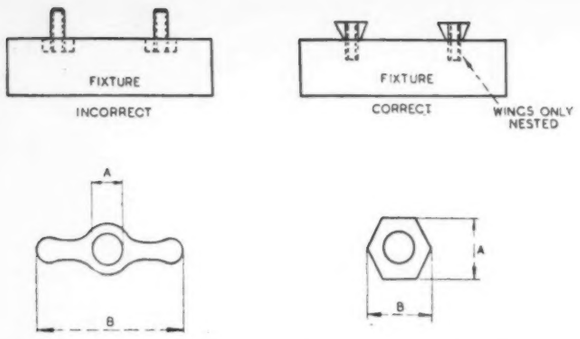



FIG. 4—Unsymmetrical parts should be nested and symmetrical parts handled.

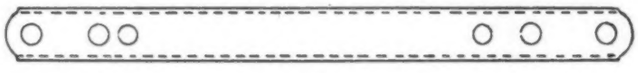
approach to the aircraft problem by motion-study methods.

The main points in connection with electrical assemblies can be summed up as follows:

(1) Convenient size of parts.
(2) Usually a relatively large number required.
(3) A definite tooling-up period is usually permissible.
(4) Total number of non-standard parts not excessive.
(5) Manufacture for stock.
(6) Wide limits; for example, bolt holes with considerable clearance.
(7) Very few assemblies require great structural strength, so that riveting and other methods of joining can be and are used.
(8) Mechanical handling, if used, other than special motion study set-ups, are light mechanisms and inexpensive.
(9) Heavy power tools other than blanking and forming presses are not required.
(10) Longer instruction periods for the operators are permissible.
(11) The limit chain effect is not usually a serious problem.

All these points favor motion study so that its rapid development in an industry offering these advantages is natural. In taking motion study from this environ-

FIG. 5—Square-section nose-rib brace in which six distance-tubes are to be a driving fit. Below is a motion study of the old method of assembly



## OLD METHOD

| LEFT HAND | RIGHT HAND | LEFT HAND (continued) | RIGHT HAND (continued) |
|---|---|---|---|
| (1) Pick up brace. | (1) Pick up $\frac{3}{16}$ in. distance tube No. 1. | (48) Pick $\frac{1}{4}$in. D.T. No. 2 up and match to brace. | (48) Pick up brace and match to D.T. |
| (2) Trial-fit brace to D.T. | (2) Trial-fit D.T. to brace. | (49) Place D.T. in vice. | (49) Return brace to bench. |
| (3) Return brace to bench. | (3) Place D.T. in vice jaws (hold). | ★ | (50) Tighten vice. |
| (4) Tighten vice. | ★ | ★ | (51) Pick up file. |
| ★ | (5) Pick up file. | (52) Use file. | (52) Use file. |
| (6) Use file. | (6) Use file. | (53) Hold D.T. | (53) Return file to bench. |
| (7) Grasp vice handle. | (7) Place file on bench. | ★ | (54) Unscrew vice. |
| (8) Unscrew vice. | (8) Hold distance tube. | (55) Pick up D.T. and match to brace. | (55) Pick up brace and match to D.T. |
| (9) Pick up brace. | ★ | (56) Return D.T. to bench. | (56) Place brace in vice. |
| (10) Trial match brace to D.T. | (10) Trial-match D.T. to brace. | (57) Tighten vice. | ★ |
| (11) Hold brace between vice jaws. | (11) Return D.T. to bench. | (58) Pick up D.T. and insert in mandrel. | (58) Pick up mandrel and place over D.T. |
| ★ | (12) Tighten vice. | | (59) Start mandrel in brace. |
| (13) Pick up D.T. | (13) Pick up insertion. | (59) Position in brace. | (60) Pick up hammer and drive mandrel into correct position in brace. |
| (14) Fit D.T. to mandrel. | (14) Fit mandrel to D.T. | (60) Slide hold to mandrel midway. | (61) Withdraw mandrel. |
| (15) Position mandrel in brace and steady. | (15) Start mandrel in brace. | | (62) Hold brace. |
| | | (61) Grasp vice handle. | (63) Match brace with D.T. |
| (16) Slide grip to half-way along mandrel and steady. | (16) Grasp hammer and drive mandrel into correct position in brace. | (62) Unscrew vice. | |
| (17) Grasp vice handle. | (17) Withdraw mandrel. | (63) Pick up $\frac{1}{4}$in. D.T. No. 3 and match with brace. | (64) Place brace on bench. |
| (18) Unscrew vice. | (18) Grasp brace. | (64) Place D.T. in vice. | (65) Tighten vice. |
| (19) Pick up $\frac{3}{16}$ in. D.T. No. 2 and trial-fit. | (19) Trial-fit brace to D.T. | ★ | (66) Pick up file. |
| (20) Place D.T. in vice. | (20) Return brace to bench. | ★ | (67) Use file. |
| ★ | (21) Tighten vice. | (67) Use file. | (68) Return file to bench. |
| ★ | (22) Pick up file. | (68) Hold D.T. | (69) Unscrew vice. |
| (23) Use file. | (23) Use file. | ★ | (70) Pick up brace and match. |
| (24) Hold D.T. | (24) Unscrew vice. | (70) Match D.T. with brace. | (71) Pick up and place brace in vice. |
| (25) Trial fit D.T. into brace. | (25) Pick up brace and trial-fit over D.T. | (71) Return D.T. to bench. | ★ |
| (26) Return D.T. to bench. | (26) Make 180 deg. wrist turn and place brace in vice. | (72) Tighten vice. | (73) Pick up mandrel and force over D.T. |
| (27) Tighten vice. | ★ | (73) Pick up D.T. and insert in mandrel. | (74) Start mandrel in brace. |
| (28) Pick up D.T. and fit into mandrel. | (28) Pick up insertion mandrel and fit over D.T. | (74) Position in brace. | (75) Pick up hammer and drive mandrel into correct position in brace. |
| (29) Position mandrel in brace. | (29) Start mandrel in brace. | (75) Slide hold to mandrel midway. | (76) Withdraw mandrel. |
| (30) Slide hold to mandrel midway. | (30) Pick up hammer and drive mandrel into correct position in brace. | (76) Grasp vice handle. | (77) Hold brace. |
| (31) Grasp vice handle. | (31) Withdraw mandrel. | (77) Unscrew vice. | (78) Match brace with D.T. |
| (32) Unscrew vice. | (32) Hold brace. | (78) Pick up $\frac{1}{4}$in. D.T. No. 4 and match with brace. | (79) Return brace to bench. |
| (33) Pick up $\frac{1}{4}$in. D.T. No. 1 and trial-fit in brace. | (33) Trial-fit brace to D.T. | (79) Place D.T. in vice. | (80) Tighten vice. |
| (34) Place D.T. in vice. | (34) Return brace to bench. | ★ | (81) Pick up file. |
| ★ | (35) Tighten vice. | ★ | (82) Use file. |
| ★ | (36) Pick up file. | (82) Use file. | (83) Return file. |
| (37) Use file. | (37) Use file. | (83) Hold D.T. | (84) Unscrew vice. |
| (38) Hold D.T. | (38) Return file to bench. | ★ | (85) Pick up brace and match with D.T. |
| ★ | (39) Unscrew vice. | (85) Match D.T. with brace. | (86) Place brace between vice jaws. |
| (40) Match D.T. with brace. | (40) Pick up brace and match with D.T. | (86) Return D.T. to bench. | ★ |
| (41) Return D.T. to bench. | (41) Make 180 deg. wrist turn with brace and place in vice. | (87) Tighten vice. | (88) Pick up mandrel and force over D.T. |
| (42) Tighten vice. | ★ | (88) Pick up and insert D.T. in mandrel. | (89) Start mandrel in brace. |
| (43) Pick up D.T. and insert in mandrel. | (43) Pick up mandrel and force over D.T. | (89) Position in brace. | (90) Pick up hammer and drive mandrel into correct position in brace. |
| (44) Position in brace. | (44) Start mandrel in brace. | (90) Slide hold to mandrel midway. | (91) Withdraw mandrel (return to bench). |
| (45) Slide hold to mandrel midway. | (45) Pick up hammer and drive mandrel to correct position in brace. | (91) Grasp vice handle. | (92) Hold brace. |
| (46) Grasp vice handle. | (46) Withdraw mandrel. | (92) Unscrew vice. | (93) Place finished brace on bench. Recommence cycle. |
| (47) Unscrew vice. | (47) Hold brace. | ★ | |

★ = *Hand idle*

ment into a less suitable one, it is necessary to examine the true degree of difference so that the approach can be modified to suit.

Motion study is flexible, but some extra effort is necessary to make the aircraft problem yield results from the application of motion study. The extra work is amply repaid, but it is an operation or an extra that is not met with in the electrical problem.

The conditions which are advantages to the electrical industry compared with the problem presented in the aircraft industry are:—

(1) Apart from a few exceptionally small sub-assembly parts, size and shape are inconvenient, though generally of little weight.

(2) Small quantities plus modifications have always been the problem of the aircraft-production engineer. In applying motion study the problem is even more acute.

(3) During the war it has been necessary to start building aircraft as soon as a contract has been placed and semi-freehand methods are used while tooling is taking place.

(4) Standardization of parts is still sadly neglected in the aircraft industry. Small pressed parts, such as gussets and cleats, differ dimensionally and practically no attempt to standardize them has been made.

(5) Except perhaps in the case of a few private-owner-type aircraft, none is manufactured for stock.

(6) Limits on plate work are from ±0.01 in. to gaps that are tight to a 0.0015 feeler. Owing to the large number of parts in an aircraft, the build-up of limit conditions becomes a serious problem, and particularly so with the application of motion-study methods.

(7) The structural quality of aircraft is probably unequalled in any other structural field, and methods of joining are of the highest order.

(8) Mechanical handling of large structural assemblies can only be justified by exceptionally large wartime contracts, but small, inexpensive conveyor handling in the electrical industries is economical.

(9) Press and squeeze-riveting machines and pelican-head units with boosts are the standard methods of assembling aircraft units.

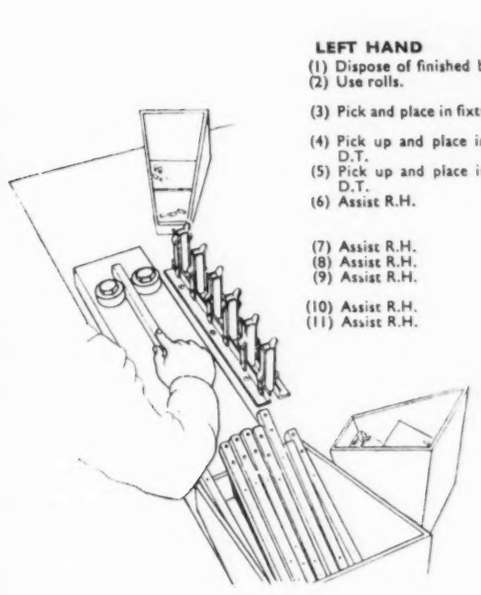
(10) Owing to short-run contracts, instruction periods for motion-economy methods must be short, so that many good methods requiring specially developed finger manipulation must be considered impracticable.

(11) The limit chain effect is the most acute problem met in the application of motion study to aircraft manufacture.

It may be considered a rather negative policy to look for the points that are of a disadvantage rather than those points that are of advantage, but as most considerations are against the application of motion study to aircraft work, it is necessary to turn as many of the disadvantages as possible into advantages. Take, for example, the disadvantage of short contract runs. It has the advantages of discouraging foreign competition, America included, from applying motion study to aircraft. If the problem is solved and motion study methods applied our lower cost per aircraft will secure export markets and, of course, our own.

A further instance is the large size of parts and assemblies. These awkward shapes are responsible for much waste effort and movement under the old methods, but the study of their manipulation will offer far higher returns for a given study period than is the case with the small electrical parts. The biggest incentive for movement study in aircraft, however, is the enormous number of man-hours involved in even a single aircraft.

It has been stated and shown that material and tools must always be located in determined and constant relative position to each other and the operator. In short, the work-place layout must be standardized for that particular run of components. If there is a



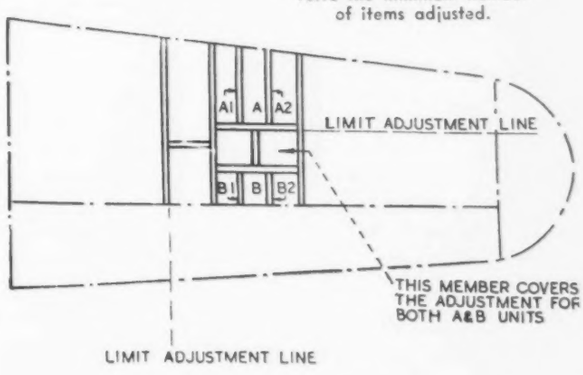

LEFT

FIG. 6—The new method of handling the assembly shown in fig. 5. The braces are adjusted to the low limit of tube variation by passing between rolls. Above is a motion study showing that the number of hand-movements has been reduced to only 22.

o o o

BELOW

FIG. 7—Position of adjustment lines. The limit adjustment line should involve the minimum number of items adjusted.



standardized work-place layout it is possible to establish a standard set of movements *if* the parts used in these movements are also standard. Supposing, for example, there is a bracket in the shape of a U, that at right angles to its vertical centre line is a hole reamed to a close limit passing through both flanges, and that this fitting must pick up accurately with a forging which goes between the two arms of the U. If, owing to variations in the drilling of the bracket or variations in the position of the base on which this bracket is mounted, shims of varying thickness must be used, it is correct to say the work conditions are not standard and therefore movements also cannot be standardized. It is well known that much skilled fitting is often required because of inaccuracies in aircraft detail parts. This inaccuracy is not necessarily

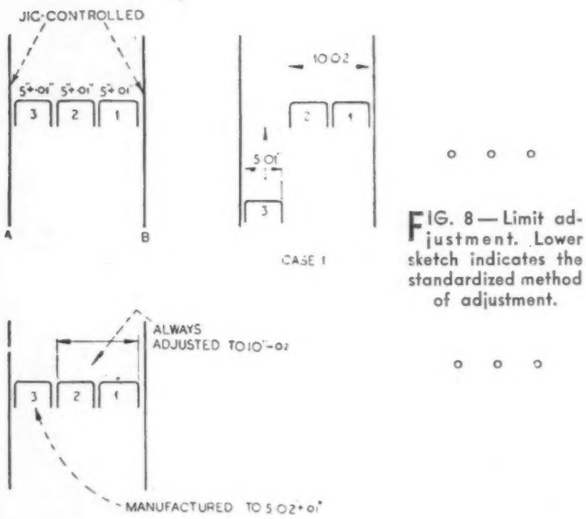



FIG. 8 — Limit adjustment. Lower sketch indicates the standardized method of adjustment.

that of tooling, but often of the many nearly unpredictable things sheet metal will do.

It has often been said that motion study cannot be applied to aircraft work because there are too many variables, and that resort must be made to "wangling" and skilled hand fitting to overcome the difficulties.

On aircraft components, however—a mainplane, for example — there are many hundreds of parts whose sum total of limits perpetuates the error. Even finer limits can be imposed on the details, but there is obviously an economic limit to this, so one of the prime considerations in applying motion study to aircraft will be to use and take advantage of the limits until the chain of parts builds up a sum error in limits that is unusable. At this point in the assembly procedure, a limit correction must be carried out: in factory nomenclature, "this is where the wangling will have to be performed."

"Wangling" (which from now on is called "limit adjustment") is, as stated previously, an effort to bring built-up variables together. There are two distinct ways of dealing with this matter—the negative way, each structure receiving individual method of adjustment according to its own resulting combination of limits, and the positive method, such as Folland Aircraft, Ltd., has developed and are continuing to develop. This positive method, which was initiated by the application of motion study, is, briefly, "the elimination of variables by adjustment." It is realized that for economic reasons adjustments must be made, but it can be rightly claimed for motion study that if adjustments are necessary, there is always a good and a bad way of making adjustments. We can consider that the bad way is that which has no fixed or standard method, the operator varying his methods to suit the different limit conditions, time and effort being required to decide and act upon the method of any limit correction. Movements will be unstudied and therefore contain much wasted effort.

The good method of adjustment will be a standard method with studied movements. Time or effort for decision will not be required. This method can be termed "positive." Fig. 6 is a simple illustration of the positive method of limit adjustment as applied by motion study. The brace is a square-section tube (18 SWG), part of a mainplane nose-rib. Six distance-tubes support the brace against collapse when the joint bolts are tightened.

The old method of fitting these distance-tubes to the brace is shown in fig. 5. This two-handed chart indicates the work movements of each hand in its relation to the other. As supplied, the tube varied from +0.0010 in. to —0.007 in. It is necessary that these distance-tubes should be a tight fit, for if any should move during rib assembly it would entail the complete dismantling of the rib. Because of this 0.008 in. variation the apparently obvious solution was adopted of supplying the tubes to the operator +0.05 in. in length so that he could file each one to suit the internal dimension of each separate brace.

Altogether, if the job were to be carried out satisfactorily with no over- or under-length filing, it required approximately 185 movements. The figure appears excessive, but even the simplest of unstudied operations, when recorded in this manner, is surprising.

In the motion study of this assembly the first step was the elimination of the variable, that is, the brace section dimension. When this was eliminated the "positive" adjustment principle was applied. A pair of rolls were made (fig. 6) and so adjusted that the roll gap was the brace-section dimension, less 0.007 in., that representing the low limit of the tube variation. By passing the braces through these rolls they were all adjusted to a common size. It will be remembered that in the old method the distance-tubes were machined oversize. With the brace section dimension controlled they are now machined to correct size +0.003 in. (for interference).

Before continuing discussion on the distance-tube to brace assembly two principles derived from experience on "positive" adjustment may be stated:—

(1) Adjustment link to be manufactured plus the sum of minus limits possible on the chain preceding it.

(2) Where choice exists, adjustment to be on a single link and not, say, on two links in parallel as $a^1$ $a^2$ and $b^1$ $b^2$ (see fig. 7).

To take a simple example of principle I, refer to fig. 8. There are three members to be fitted by standard movements between two fixed jigged members, *A* and *B*. If the limits on the manufacture of the parts (from now on called links) were the usual ±0.01 in. for aircraft, case I, say, would be obtained. Link No. 3 cannot be fitted because the space remaining for it, 0.03 in., is too small. The operator would then make a decision on how to deal with this condition

and his movements would obviously be different from the movements he would be forced to use if the limit combination had resulted in the gap being 0.03 in. too big. Between these two extremes lie a multitude of possible combinations of limits, so that a standardized sequence of movements, with its much-desired habitual performance, is impossible.

Now when principle No. 1 of limit adjustments is applied the situation is entirely different. It is noted the sum of the possible minimum limits on links 2 and 3 is 0.02 in. Add this to the manufactured dimension of link 3 and we get 5.02 in. ±0.01 in. (It is to be remembered the ±0.01 in. is the limit in which the parts are serviceable for a given standard set of movements.) For the actual adjustment a small lever-operated sizing-tool presses the flange on link No. 2 back 0.02 in., so that the limit combination of links 1 and 2 is always standardized, and the variation eliminated. The limits on each link will not allow the sum limit of both to be less than 10 in. —0.02 in. and the sizing tool brings all dimensions above this back to it. Now that the variables are eliminated and link 3 is +0.02 in., assembly can be carried out with a standard sequence of movements.

By positive limit-adjustment the job has been brought within the field of practical motion study application. In anticipation of the question: "is it allowable to bend aircraft parts on site" it may be added that a sizing link can be supplied from the refrigerator in normalized condition, or, if the inside bend is not under three times the thickness of the plate, it is unnecessary to normalize.

## New Structural Material Announced

POSSESSING tremendous strength beneath a mirrorlike exterior, a new constructional material, Metalite, has been announced by Chance Vought Aircraft Division of United Aircraft Corp., Stratford, Conn. The new product, basically a metal-faced sandwich material employing a light-weight core to separate and stabilize the metal faces, was designed to meet the demand for a stronger, lighter, and sleeker structural material required in the construction of the high performance aircraft of the future.

Engineers see in Metalite a solution to two factors, wrinkling and parasite drag, which have reduced the efficiency of the modern laminar flow airfoil, which requires uninterrupted airflow to attain its maximum efficiency. Skin wrinkling, caused by the great masses of air passing at high speeds over the surface of future planes, can be reduced to a minimum without resorting to massive interior structure, and whole panels can be fabricated with scarcely a single protuberance interrupting the airflow.

In addition, it has important advantages for interior structures, since most of the conventional stiffeners and other auxiliary members may be eliminated As a result of simplification of structure, a substantial reduction in the number of operations in production appears possible. Other uses, outside the aircraft field, are envisaged, including radios, refrigerators washing machines, and similar items where light weight and moisture proof construction would be a decided advantage from the point of view of both user and shipper. Its use in prefabricated houses and other structures is also foreseen since in this field its strength, lightness, and durability would be of primary importance.

The material consists of thin sheets of high-strength aluminum alloy, separated by a thick, low-density core of balsa wood, and bonded together to form a single, light, rigid unit. The grain direction of the balsa core is set perpendicular to the metal faces, and where still greater strength is desired, a core material of greater density than balsa may be used. The core is relatively thick in comparison to the face plates.

Moderate heat and pressure is employed for bonding, and all bonds are ordinarily made in one operation with the parts or assembly in a mold of the desired shape. For gentle curves, the work can be assembled flat on a bench, and the entire assembly placed in a mold and forced into the desired shape by the application of pressure.

Because of the thickness gained by the light core, the bending stiffness of a completed Metalite panel is many times greater than that of a simple sheet of metal of the same weight, and the hard metal faces cannot be easily damaged. Typical panels can be walked on without injury to the material.

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CUTAWAY drawing showing the basic construction of Metalite. Thin plates of aluminum alloy are bonded to a core of end-grain balsa wood.

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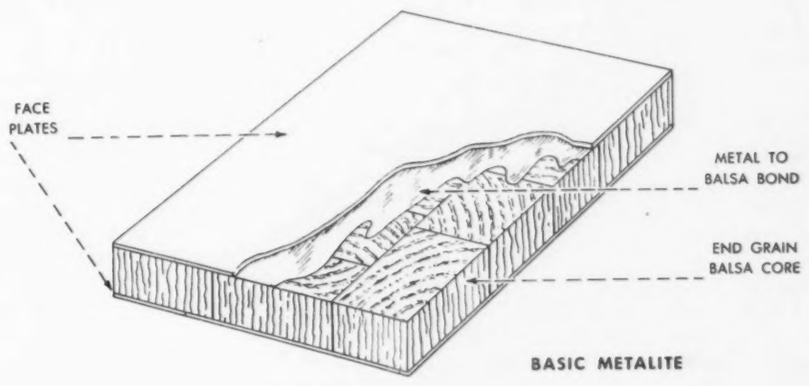


BASIC METALITE

# Heat Treatment

FIG. 1—Stainless steel screws (AISI 416) hardened at 1850°F and tempered at 980°F, and bomb-shackle rollers and pins (AISI 410) hardened at 1850°F and tempered at 850°F.

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IN the heat treating of ferrous metals there is an intermediate temperature range, 1750 to 1950°F, which is above the range ordinarily used for plain carbon steels and below the one used for high-speed steels. This particular range is required for the thermal treatment of either the chrome-nickel or the straight chrome-high carbon type stainless steels.

The methods and equipment for both the low (1450 to 1650°F) and the high range (2150 to 2350°F) heat treatments have been, due to demand and practice of many years, well defined and established, but the methods and the equipment for the intermediate range have only recently received the proper attention. Until a few years ago producers often hesitated to make any part out of a steel that required, either for annealing or hardening, a temperature range of 1750 to 1950°F. There was often sound reasoning for this attitude. The equipment ordinarily available was not suitable or adequate to take care of such heat treatment properly. For example, a large high carbon-chrome die is finished after days of skilled work, and is consigned to the heat treating shop. How should it be hardened? Should it be packed and heated in a muffle furnace? In such a case, how should the temperature of the die be controlled and the necessary timing be determined? Should it be packed in a carbonaceous or inert material? Soft spots, warping, scaling and cracking must be prevented. If the die cracks, it is completely lost; if warped or scaled heavily it requires long hours and days of scale removal and refinishing.

The question also arises as to the use of a controlled atmosphere. If desirable, what particular gas or mixture of gases from an almost infinite number of combinations should be used—or should a salt bath be employed? Here also, the type of salt bath used, the correct time cycle and the prevention of decarburization and cracking are problems which must be solved.

Most of the difficulties enumerated above have been minimized and overcome. During recent years the use of stainless steels has expanded rapidly and along with it, the methods and technique of heat treating have been developed and improved so that today these steels can be handled for heat treatment with the same facility and assurance as plain carbon steels.

One of the improved and extensively used processes is the method wherein a molten salt bath is used as a source of heat to bring the steel to, or hold at, a desired temperature. Such a bath may be heated by gas, oil or electricity depending upon availability and economy.

*Some other phases of the use of salt baths are discussed in* THE IRON AGE, *Feb.* 14, 1946, *p.* 46.

For the container, either a pressed steel, cast alloy or ceramic pot, may be used. If gas or oil is preferred, then a metal pot has to be employed since in such instances the source of heat is outside the pot, and the pot has to be a good conductor of heat (ceramic materials, with the exception of graphite and silicon carbide, are not). At the elevated temperatures employed, the life of a cast alloy metal pot is rather short, 2 to 3 weeks at the most. To maintain a temperature of 1850°F in a gas-fired pot, the furnace chamber temperature has to be as high as 2000°F or more. At such temperatures a metal pot rapidly scales, and minute defects are exposed and enlarged, often causing premature failure.

On the other hand, if electricity is used, a ceramic pot may be utilized, heating the salt bath with electrodes immersed in the bath itself. Such a pot has proven advantageous since it avoids contamination of the bath with metallic oxides (as is the case with metal pots) and it has a longer life, lasting 2 to 3 yr operating at such temperatures, as against 4 to 6 months for an alloy pot. These features will be considered in greater detail in the following discussion.

Before outlining the precise technique of heat treating at these temperatures it is desirable to review briefly the furnace equipment necessary to properly carry out these operations. Stainless steels ordinarily do not require a preheat. Usually they are either quenched in water, as for annealing austenitic types, or in oil, as in the hardening of cutlery types. However, the high carbon-chrome stainless steel parts, particularly dies of larger size, require a pre-

# of Stainless Steel

By HAIG SOLAKIAN
*Vice President, A. F. Holden Co., New Haven, Conn.*

***The practical aspects of heat treating stainless steels, air hardening and high carbon chrome, in salt baths are herein discussed. The functions of the preheat, high-heat and quench baths in heat treating articles efficiently and economically are outlined, as well as recommendations covering the use of different types of containers for these three operations.***

heat. In addition it has been found beneficial to quench such dies into another salt bath at lower temperature instead of quenching into air or oil. Therefore, one must consider three furnaces for the most suitable heat treatment of parts and dies made of air hardening steels: A preheat furnace, operating between 1250 to 1450°F; a high temperature furnace, operating between 1650 to 1950°F; and a quenching furnace, running between 900 to 1100°F. Since the preheat and the quenching pot temperatures are low, a gas-fired furnace with an alloy pot may be used, although an electrode furnace in both instances will prove to be more satisfactory and economical in the long run. However, the high temperature furnace should be of electrode type with a ceramic pot.

The features of a gas-fired furnace need not be considered here. Such furnaces have been in common use for many years and their characteristics and operation are well known. However, the characteristics of an electrode furnace will be discussed in more detail.

Fig. 3 illustrates a single-unit electrode furnace indicating a ceramic pot and the way the electrodes are introduced into the pot. Such furnaces can be built single phase, with two electrodes, or three phase with three electrodes. The three phase setup is preferred because of better balance in electric power lines.

Fig. 4 shows a three-unit furnace with the preheat, high-heat and quench baths all in one shell. The preheat and quench baths are gas fired, and the high-heat bath is electrode heated. In the five-sided pot the electrodes are noted to be confined to one corner, permitting a larger surface area to be utilized for hardening work. A sectional view of the gas-fired furnace is shown in fig. 5.

### Furnace Operation

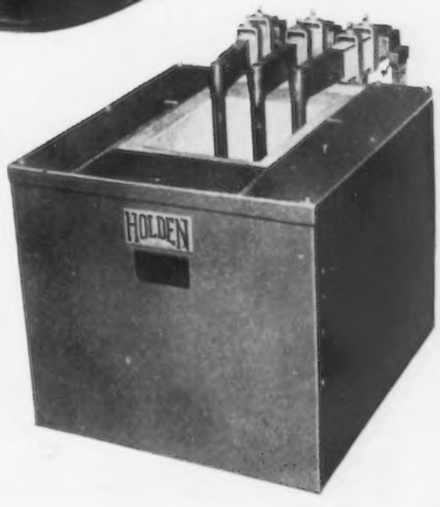
For the heat treatment of air hardening dies, the preheat and the high-heat pots are filled with neutral salt bath but the quench pot is usually filled with an alkaline bath containing some cyanide. The presence of sodium cyanide in the quenching bath helps to clean the parts better, and at the same time imparts a certain degree of surface hardness which is often beneficial on parts and dies that may have to resist wear. In operating such a unit certain precautions should be stressed:

(A) The salt bath used in both the preheat and the high-heat should not only be neutral, but should be kept neutral by proper checkup and necessary rectifying. Neutral baths, no matter how stable, slowly break down, producing oxides and carbonates. Further, if a metal pot is used metallic oxides are washed into the bath. All of these oxides and carbonates have a strong tendency to decarburize and sometimes pit the work being treated. Such baths, operating at high temperatures, should be properly neutralized by rectifiers, with the bath analyzed periodically to be sure that it is in a satisfactory condition for safe heat treating. On the other hand, the quench salt should be cleaned periodically of any sludge which may accumulate due to carry-over from the high temperature bath. Furthermore, the quench salt should not be carried over by baskets or fixtures to contaminate the preheat bath. All fixtures and baskets carried over into the quenching bath should be washed clean before being used over again in the preheat and the high-heat baths.

(B) The volume of salt in the pot should be suffi-

ABOVE

FIG. 2 — Stainless steel wire (AISI 434) annealed at 1800°F.




RIGHT

FIG. 3 — Electrode furnace showing electrodes in position in ceramic pot.

cient to prevent excessive drop in temperature and to avoid the necessity of a prolonged time period for its recovery. A desirable ratio would be about 5 lb of salt bath for 1 lb of steel to be treated. If a preheat is used, a ratio of 4 lb of salt bath for 1 lb of steel to be treated at one time is satisfactory.

(C) Timing is an extremely important factor and should be given a great deal of thought. In general practice the danger quite frequently is overtiming. The old school of heat treating always recommended a "long soak"—how long no one definitely knew—which was often left to the disposition or discretion of the operator. Precise timing is an art that is acquired only after long experience and careful observation. A tentative schedule for timing in the preheat, as well as in the high-heat, is given below, bearing in mind that in proper timing only the minimum dimensions of a uniform part are considered and that for a flat or cylindrical object the length is not taken into account at all.

| Thickness Or Diameter Of Part, In. | Time at Preheat, Min | Time at High-Heat, Min |
|---|---|---|
| ¼ | 2 | 1¼ |
| ⅜ | 2½ | 2¼ |
| ½ | 3¼ | 2¼ |
| ⅝ | 3¾ | 3 |
| ¾ | 4¼ | 3¼ |
| ⅞ | 4¾ | 3¾ |
| 1 | 5½ | 4½ |
| 1½ | 8 | 6½ |
| 2 | 11 | 9 |
| 3 | 18 | 14 |

It must be borne in mind that round pieces require less time to heat than flat pieces. Therefore, these times may be modified (increased or shortened), depending upon the individual conditions, but on the whole the schedule as outlined above should serve as a guide to prevent excessive under or overtiming. The above values for timing are expressed in the curves shown in fig. 6, which may serve to determine the time for intermediate sizes. These values are for solid, uniform shapes. If there are holes, teeth or recesses cut in the piece, the time as given above should be reduced accordingly.

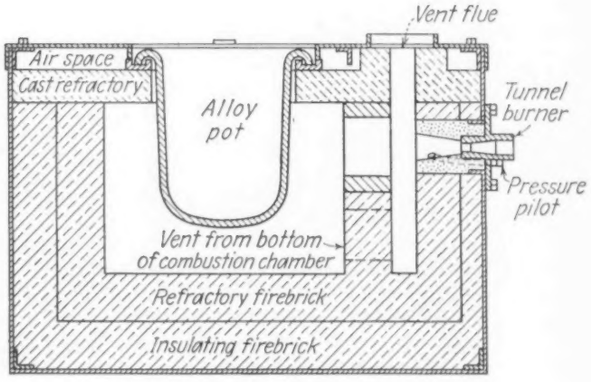
Some examples of parts heat treated by the salt bath method are shown in fig. 1. The photo shows stainless steel screws, AISI 416, hardened at 1850°F and tempered at 980°F and AISI 410 stainless bomb-shackle rollers and pins hardened at 1850°F and tempered at 850°F. Fig. 2 shows AISI 434 stainless wire annealed at 1800°F.

Fig. 7 shows an air hardening die for die casting, preheated for 20 min at 1450°F, held in the high-heat bath 12 min at 1850°F, quenched into the low temperature bath for 5 min at 1000°F, cooled in air, and tempered at 1000°F for 2 hr. Such a die, after hardening and tempering in a salt bath, was polished and finished in 2 hr instead of 2 days, as is usually required for a die hardened by packing.

The advantages derived from proper salt bath hardening may be summed up as: (1) Freedom from scale; (2) freedom from decarburization; (3) uniform hardness and (4) minimum distortion. These advantages reduce spoilage, and cut down on the grinding and finishing time.

A safe, tried method for heat-treating ferrous metals within the range of 1750 to 1950°F is as follows:

**Stainless Steels**—A high temperature neutral bath operating in an electrode furnace, preferably with a ceramic pot, is recommended. The parts are heated




ABOVE

Fig. 5—Sectional view of a gas-fired furnace.

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LEFT

FIG. 4—A three-unit furnace with preheat, high-heat and quench baths all in one shell.

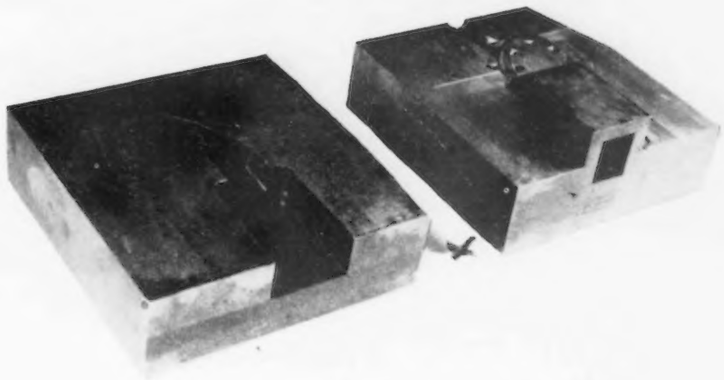
long enough to bring them up to temperature and quenched either in oil or water depending upon the type of steel and the results desired.

**Air Hardening Steels**—(a) A neutral preheat bath heated with gas or electrodes, preferably electrodes, in a ceramic pot; (b) a neutral high-heat bath heated with electrodes in a ceramic pot; and (c) a quench bath heated by gas or electrodes in a pressed steel or an alloy pot.

The technique, briefly, is: The tool or die is either wired or placed on a fixture or in a basket. It is fully preheated between 1350 to 1450°F, transferred to the high-heat bath operating between 1750 to 1950°F,

RIGHT

FIG. 7—Air hardening die for use in die casting.



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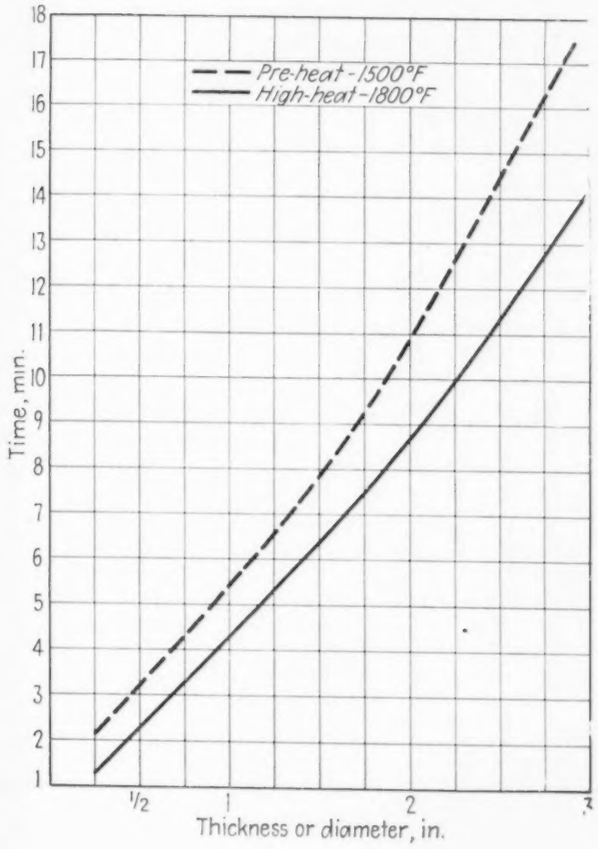
BELOW

FIG. 6—Time control chart for preheat and high-heat of various sizes of high carbon-chrome steel. Specific heat of the steel is 0.11 Btu, density 482 lb per cu ft.




held in accordance with the timing schedule given above, and quenched into the low temperature bath at around 950 to 1000°F for several minutes, followed by air cooling or oil quenching. This quenching into a low temperature bath is not absolutely necessary, but it helps to avoid distortion and cracking and at the same time produces a clean surface.

Thus far, hardening, that is heating to high temperatures and quenching, alone has been stressed. The heat-treating operation, however, is not complete without the proper tempering which must follow hardening. During hardening the tool is subjected to severe stresses, which are often of such magnitude as to cause cracking. To eliminate this hazard, and at the same time obtain the desired hardness, the tool must be tempered. The tempering temperature varies from 300 to 1100°F (most commonly around 400°F), the precise temperature chosen depending upon the service requirements. Since tempering is carried out at relatively low temperatures, no particular difficulty is encountered and it is only necessary to add that such parts, tools or dies should not be allowed to remain untempered for hours or days, but should be tempered as soon as they are cool enough to handle. Certain stainless steels, particularly, should be tempered as soon as they drop to around 250°F, i.e., before reaching room temperature.

The above technique covering hardening and tempering has proven successful, and if carefully followed, will eliminate many of the difficulties in heat treating air-hardening dies.

## Torch Cuts 24 In.-Steel at 3 In. per Min.

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CUTTING a 24 in.-billet at a speed of 3 in. per min.

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WHAT is described by Linde Air Products Co. as the world's largest blow pipe is shown in the accompanying illustration cutting up the hot-top ends of a partially forged ingot of chrome-nickel-molybdenum steel, 24 in. thick, at a speed of 3 in. per min. The use of this oxyacetylene method for cutting hot-top scrap into charging box size is claimed to have resulted in savings of 50 pct over the previous method. The blow pipe is designated as an Oxweld type C-45.

# High Temperature Alloys

***The preparation of vitallium base high temperature alloys is described, followed by a tabular listing of high temperature rupture and creep results. A discussion of various alloys that were found to be nonforgeable, as well as a comparison between casting and forging grades, are also presented. The Ni-Cr-Co-Fe base alloys are explored from the standpoint of the effect of variations in heat treatment on high temperature rupture properties.***

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By N. J. GRANT
*Massachusetts Institute of Technology*

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VITALLIUM base alloys were prepared in exactly the same way as were the Ni-Cr-Co-Fe base alloys. Table VIII lists the alloys made and tested thus far in the vitallium group; the nomenclature follows the same pattern as given for the Ni-Cr-Co-Fe group. The letter V now designates the vitallium base composition of 69 pct Co, 23 pct Cr and 6 pct Mo. Where tantalum is added the series becomes the VT series; where nickel is added the series becomes VN; and where zirconium is added it becomes VZ, etc. The number immediately following the series designation—before the hyphen—indicates the amount of the alloying element in percent added to the base composition. Again the number following the hyphen indicates whether nitrogen was added. The number 2 indicates only residual whereas the number 1 indicated added nitrogen.

*The first part of this four-part article discussed the preparation of forging type alloys and Ni-Cr-Co-Fe base cast alloys and reported results of rupture and creep tests. The effects of various factors on the properties of the Ni-Cr-Co-Fe base alloys will be explained in a subsequent issue of* THE IRON AGE.

Table IX lists the stress rupture results at 1500° and 1600° F for various stresses.

Table X gives the preliminary creep results in the vitallium base systems.

### Nonforging Alloys

In the course of preparing the various alloys it was noted that certain grades were totally nonforgeable. These alloys failed very suddenly in most cases with little preliminary deformation. In other cases the cracks started at the edges and at the ends of bars and progressed rapidly to complete failure with further forging. No cause of failure was indicated from a study of the cooling rates of the ingots which

TABLE VII

Creep Test Results at 1500°F on Ni-Cr-Co-Fe Base Cast Alloys

| Alloy | Heat Treatment[1] | Aging Treatment | Load, Psi | Total Creep | | Minimum Creep Rate | | Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | | Hr | Elongation, in. per in. | Hr | Pct per hr | |
| 30TA-1 | 2250°, WQ | None | 7,000 | 670 | 0.00350 | 200-670 | 0.000198 | Discontinued |
| 15TG-1 | 2300°, WQ | None | 8,500 | 650 | 0.00215 | 200-650 | 0.000130 | Discontinued |
| 61N-2 | 2260°, WQ | None | 10,000 | 1030 | 0.00118 | 200-1030 | 0.0000023 | Holder failed. Final |
| 93N-2 | 2250°, WQ | None | 12,000 | 2030 | 0.00155 | 1100-2030 | 0.000007 | Final |
| 93N-2[2] | 2260°, WQ | None | 13,500 | 2230 | 0.0020 | 1600-2230 | 0.000012 | Final |
| 108N-2 | 2260°, WQ | None | 13,500 | 2230 | 0.0023 | 1300-2230 | 0.00002 | Final |
| 108N-2 | 2260°, WQ | None | 15,000 | 1700 | 0.0035 | 800-1700 | 0.000012 | Holder failed. Final |
| 151N-2 | 2260°, WQ | None | 12,000 | 800 | 0.0037 | 300-800 | 0.00012 | Discontinued |
| 116P-2 | 2260°, WQ | None | 12,000 | 2000 | 0.0033 | 1200-2000 | 0.000028 | Final |
| 104NT-2 | 2260°, WQ | None | 13,500 | 2500 | 0.0016 | 1600-2500 | 0.000019 | Final |
| 104NT-2 | 2260°, WQ | None | 15,000 | 2400 | 0.0022 | 1400-2400 | 0.000030 | Final |
| 112NT-2 | 2260°, WQ | None | 16,000 | 650 | Poor temperature control | | | Discontinued |
| 121N-1B | 2260°, WQ | None | 15,000 | 2600 | 0.0018 | 1400-2600 | 0.00001 | Final |
| 99NT-1B | 2260°, WQ | None | 15,000 | 2100 | 0.0023 | 1100-2100 | 0.000024 | Final |

[1] All temperatures in °F
[2] Test originally started at 10,000 psi, raised to 13,500 psi after 240 hr

## TABLE VI

### Rupture Results on Cast Ni-Cr-Co-Fe Base Alloys at 1500° and 1600°F at Stresses From 15,000 to 30,000 Psi

| Alloy | Heat Treatment[1] | Aging Treatment[1] | Temperature, °F | Stress, Psi | Hours to Fracture | Elongation, Pct | R. A. Pct | Min Creep Rate Pct per hr |
|---|---|---|---|---|---|---|---|---|
| 30TA-1 | 2250°, WQ | None | 1500 | 20,000 | 33.8 | 10.7 | 19.2 | ..... |
| | 2300°, WQ | None | 1500 | 20,000 | 11.5 | 1.3 | 2.2 | ..... |
| | 2250°, WQ | None | 1500 | 15,000 | 256.0 | 14.1 | 23.4 | ..... |
| 24TA-1 | 2250°, WQ | None | 1500 | 20,000 | 35.0 | 12.1 | 17.6 | ..... |
| | 2250°, WQ | None | 1500 | 15,000 | 232.0 | 13.5 | 18.2 | ..... |
| 17TA-1 | 2300°, WQ | 24 hr, 1550° | 1500 | 20,000 | 0.3 | Recrystallization at 2300°; see other poor results at 2300° F in this series. | | |
| | 2300°, WQ | None | 1500 | 20,000 | 2.5 | | | |
| | 2300°, WQ | 24 hr, 1500° | 1500 | 20,000 | 0.5 | | | |
| 24TD-1 | 2250°, WQ | None | 1500 | 20,000 | 31.0 | 8.1 | 27.8 | ..... |
| | 2300°, WQ | None | 1500 | 20,000 | 54.3 | 6.0 | 27.0 | ..... |
| | 2350°, WQ | None | 1500 | 20,000 | 17.1 | 4.1 | 13.2 | ..... |
| | 2300°, WQ | None | 1500 | 15,000 | 420.0 | 11.2 | 21.5 | ..... |
| 18TD-1 | 2300°, WQ | None | 1500 | 20,000 | 0.0 | Recrystallization | | |
| | 2300°, WQ | None | 1500 | 20,000 | 0.0 | | | |
| 18TG-1 | 2300°, WQ | None | 1500 | 20,000 | 62.0 | 16.8 | 30.6 | 0.040 |
| | 2300°, WQ | 24 hr, 1600° | 1500 | 20,000 | 40.0 | 14.2 | 24.1 | ..... |
| 15TG-1 | 2300°, WQ | 24 hr, 1550° | 1500 | 20,000 | 10.0 | 14.5 | 20.4 | ..... |
| | 2300°, WQ | 24 hr, 1500° | 1500 | 20,000 | 23.3 | 15.4 | 20.6 | ..... |
| 15TG-2 | 2300°, WQ | None | 1500 | 20,000 | 16.8 | 12.9 | 24.0 | ..... |
| 17TG-2 | 2300°, WQ | None | 1500 | 20,000 | 22.0 | 16.0 | 21.3 | ..... |
| | 2300°, WQ | None | 1500 | 20,000 | 19.0 | 17.1 | 9.8 | ..... |
| | 2250°, WQ | None | 1500 | 20,000 | 28.0 | 12.5 | 14.8 | ..... |
| 13TEOB-1 | 2300°, WQ | None | 1500 | 20,000 | 42.0 | 10.0 | ..... | ..... |
| 42MT9-1 | 2300°, WQ | None | 1500 | 20,000 | 1.5 | Recrystallized | | |
| | 2250°, WQ | None | 1500 | 20,000 | 204.6 | 4.6 | 4.4 | 0.017 |
| | 2280°, WQ | None | 1500 | 20,000 | >240.0 | Incomplete | | 0.023 |
| | 2280°, WQ | None | 1500 | 20,000 | 198.6 | 7.1 | 2.4 | ..... |
| 19N-2 | 2260°, WQ | None | 1500 | 30,000 | 1.2 | 14.4 | 11.8 | 10.0 |
| | 2250°, WQ | None | 1500 | 20,000 | 68.5 | 16.0 | 15.8 | 0.047 |
| | 2300°, WQ | None | 1500 | 20,000 | 60.8 | 11.4 | 7.6 | ..... |
| 61N-2 | 2250°, WQ | None | 1500 | 30,000 | 21.3[2] | 7.0 | 3.0 | ..... |
| | 2260°, WQ | None | 1500 | 30,000 | 28.6 | 5.6 | 1.7 | 0.073 |
| | 2250°, WQ | None | 1500 | 20,000 | 341.0 | 7.8 | 2.4 | 0.017 |
| 86N-2 | 2250°, WQ | None | 1500 | 30,000 | 55.0 | 4.8 | 2.0 | 0.036 |
| | 2250°, WQ | None | 1500 | 30,000 | 47.5 | 4.0 | 1.0 | 0.036 |
| | 2250°, WQ | None | 1500 | 30,000 | 69.5[5] | 4.8 | 2.0 | 0.041 |
| | 2250°, WQ | 200 hr 1500° | 1500 | 20,000 | 828.0 | 3.1 | 1.7 | 0.0020 |
| 87N-2 | 2300°, WQ | None | 1500 | 20,000 | 0.2 | Recrystallization | | |
| | 2300°, OQ | None | 1500 | 20,000 | 191.8 | 4.0 | 1.6 | ..... |
| | 2280°, WQ | None | 1500 | 20,000 | >281.5 | Incomplete | | ..... |
| | 2250°, WQ | None | 1500 | 20,000 | 960.0 | 3.6 | 1.6 | 0.0018 |
| | 2250°, WQ | None | 1500 | 15,000 | 3450.0 | Discontinued | | 0.00015 |
| 93N-2 | 2250°, WQ | None | 1500 | 30,000 | 101.2 | 7.1 | 1.6 | 0.035 |
| | 2250°, WQ | 200 hr 1500° | 1500 | 30,000 | 22.3 | 5.4 | 4.4 | ..... |
| | 2250°, WQ | None | 1500 | 20,000 | 1200.0 | 3.5 | 0.5 | 0.0007 |
| 104N-2 | 2260°, WQ | None | 1500 | 30,000 | 72.0 | 4.6 | 1.0 | 0.037 |
| | 2260°, WQ | None | 1500 | 30,000 | 44.5[2] | ..... | ..... | ..... |
| 108N-2 | 2250°, WQ | None | 1500 | 20,000 | >590.0 | Broke in grip failure | | |
| | 2250°, WQ | None | 1500 | 20,000 | 1080.0 | 1.8 | 0.0 | 0.00050 |
| 111N-2 | 2250°, WQ | None | 1500 | 30,000 | 27.2 | 7.2 | 3.2 | ..... |
| | 2250°, WQ | None | 1500 | 30,000 | 52.7 | 6.0 | 1.0 | 0.027 |
| | 2250°, WQ | None | 1500 | 20,000 | 1841.0 | 3.3 | 0.5 | 0.00027 |
| 115N-2 | 2260°, WQ | None | 1500 | 30,000 | 52.7 | 4.0 | 1.0 | 0.027 |
| | As cast | None | 1500 | 30,000 | 7.0 | 12.0 | 7.8 | 1.71 |
| 151N-2 | 2250°, WQ | None | 1500 | 30,000 | 9.1 | 2.5 | 2.3 | 0.30 |
| | 2250°, WQ | None | 1500 | 30,000 | 9.5 | 4.7 | 2.0 | 0.30 |
| 156N-2 | 2300°, WQ | None | 1500 | 20,000 | 112.3 | Recrystallization | | |
| | 2250°, WQ | None | 1500 | 20,000 | 534.0 | 3.0 | 0.5 | 0.0040 |
| | 2300°, WQ | None | 1500 | 15,000 | 293.0 | 3.5 | Recrystallization | |
| 30P-2 | 2250°, WQ | None | 1500 | 30,000 | 4.7 | 5.0 | 2.0 | 1.00 |
| | 2260°, WQ | None | 1500 | 30,000 | 2.8 | 4.0 | 2.0 | ..... |
| | 2250°, WQ | None | 1500 | 20,000 | 155.0 | 8.0 | 2.5 | 0.035 |
| 95P-2 | 2260°, WQ | None | 1500 | 30,000 | 30.7 | 3.0 | 1.0 | 0.072 |
| | 2260°, WQ | None | 1500 | 30,000 | 32.0 | 2.5 | 1.0 | 0.050 |
| 117P-2 | 2260°, WQ | None | 1500 | 30,000 | 70.6 | 1.6 | 0.8 | 0.020 |
| 116P-2 | 2260°, WQ | None | 1500 | 20,000 | 885.0 | 2.8 | 0.5 | 0.0015 |
| 40S-2 | 2250°, WQ | None | 1500 | 30,000 | 4.6 | 4.0 | 0.5 | ..... |
| | 2250°, WQ | None | 1500 | 20,000 | 174.5 | 8.9 | 1.3 | 0.013 |
| 76S-2 | 2250°, WQ | None | 1500 | 30,000 | 15.1 | 4.0 | 1.0 | ..... |
| 80S-2 | 2250°, WQ | None | 1500 | 30,000 | 11.1[2] | ..... | ..... | ..... |
| | 2300°, WQ | None | 1500 | 30,000 | 0.0 | Recrystallization | | |
| | 2250°, WQ | None | 1500 | 20,000 | 302.5 | 2.0 | 0.5 | 0.0054 |
| 37SA-2 | 2260°, WQ | None | 1500 | 30,000 | 2.0 | 8.0 | 3.7 | 4.0 |
| | 2260°, WQ | None | 1500 | 30,000 | 2.0 | 11.2 | 6.1 | |
| | 2260°, WQ | None | 1500 | 30,000 | 2.0[5] | 6.4 | 8.6 | ..... |

## TABLE VI—Continued

### Rupture Results on Cast Ni-Cr-Co-Fe Base Alloys at 1500° and 1600°F at Stresses From 15,000 to 30,000 Psi

| Alloy | Heat Treatment[1] | Aging Treatment[1] | Temperature, °F | Stress, Psi | Hours to Fracture | Elongation, Pct | R. A. Pct | Min Creep Rate Pct per hr |
|---|---|---|---|---|---|---|---|---|
| 82SA-2 | 2250°, WQ | None | 1500 | 30,000 | 5.4 | 2.4 | 1.0 | 0.136 |
| | 2260°, WQ | None | 1500 | 30,000 | 3.3[5] | 1.5 | 0.5 | ..... |
| | 2250°, WQ | None | 1500 | 25,000 | 22.7 | 2.8 | 0.5 | ..... |
| 75M-1 | 2300°, WQ | None | 1500 | 30,000 | 0.0 | Recrystallization | | |
| | 2280°, WQ | None | 1500 | 30,000 | 17.0 | 2.4 | 1.0 | ..... |
| 107M-1 | 2280°, WQ | None | 1500 | 30,000 | 0.5 | Appears recrystallized | | |
| | 2260°, WQ | None | 1500 | 30,000 | 15.7 | 1.5 | 0.5 | ..... |
| | 2260°, WQ | None | 1500 | 30,000 | 26.3[5] | 4.8 | 2.4 | 0.015 |
| 123M-1 | 2320°, WQ | None | 1500 | 30,000 | 4.7 | Appears recrystallized | | |
| | 2300°, WQ | None | 1500 | 30,000 | 88.0 | 3.6 | 0.5 | 0.040 |
| | 2250°, WQ | None | 1500 | 30,000 | 31.3 | 8.8 | 5.6 | ..... |
| | 2300°, WQ | None | 1500 | 20,000 | 6.8 | Recrystallized | | |
| | 2280°, WQ | None | 1500 | 20,000 | 848.0 | 1.5 | 0.5 | 0.0011 |
| 125M-1 | 2260°, WQ | None | 1500 | 30,000 | 38.5 | 5.6 | 1.2 | 0.027 |
| | 2260°, WQ | None | 1500 | 30,000 | 34.8 | 4.0 | 1.0 | 0.050 |
| 136M-1 | 2260°, WQ | None | 1500 | 30,000 | 5.7[2] | 2.5 | 0.5 | ..... |
| 32NT-2 | 2260°, WQ | None | 1500 | 30,000 | 2.0 | .... | .... | ..... |
| | 2300°, WQ | None | 1500 | 20,000 | 0.0 | Recrystallized | | |
| | 2280°, WQ | None | 1500 | 20,000 | 182.0 | 1.5 | 1.6 | ..... |
| | 2250°, WQ | None | 1500 | 20,000 | 295.0 | 8.5 | 2.5 | 0.023 |
| | 2300°, OQ | None | 1500 | 20,000 | 0.2 | Recrystallized | | |
| | 2250°, OQ | None | 1500 | 15,000 | 956.0 | 5.6 | 1.0 | 0.00206 |
| 86NT-2 | 2250°, WQ | None | 1500 | 30,000 | 55.0 | 5.0 | 2.0 | ..... |
| | 2275°, WQ | None | 1500 | 20,000 | 898.0 | 6.0 | 1.6 | ..... |
| 92NT-2 | 2260°, WQ | None | 1500 | 30,000 | 52.8 | 4.0 | 1.6 | 0.032 |
| | 2250°, WQ | None | 1500 | 30,000 | 51.8 | 5.6 | 1.2 | 0.050 |
| | 2250°, WQ | None | 1500 | 25,000 | 390.5 | 3.0 | 1.6 | 0.0023 |
| | 2260°, WQ | None | 1500 | 20,000 | 1606.0 | 3.0 | 1.0 | 0.00035 |
| 93NT-2 | 2260°, WQ | None | 1500 | 30,000 | 76.2 | 5.3 | 2.8 | 0.026 |
| | 2200°, WQ | None | 1500 | 30,000 | 40.2 | 6.0 | 2.3 | 0.073 |
| | 2100°, WQ | None | 1500 | 30,000 | 23.5 | 9.2 | 9.0 | 0.333 |
| 94NT-2 | 2260°, WQ | None | 1500 | 30,000 | 80.0 | 4.8 | .... | ..... |
| | 2200°, WQ | None | 1500 | 30,000 | 45.5 | 5.7 | 3.2 | 0.075 |
| | 2100°, WQ | None | 1500 | 30,000 | 29.7 | 9.7 | 4.3 | 0.320 |
| | 2100°, WQ | None | 1500 | 25,000 | 211.8 | 4.7 | 2.6 | 0.0081 |
| | 2100°, WQ | None | 1500 | 25,000 | 116.6 | 7.0 | 5.1 | 0.032 |
| 96NT-2[3] | 2260°, WQ | None | 1500 | 30,000 | >75.0 | Poor temperature control | | |
| | 2260°, WQ | None | 1500 | 30,000 | 81.2 | 4.0 | 1.0 | 0.021 |
| | 2260°, WQ | None | 1500 | 30,000 | 85.4 | 4.8 | 1.9 | 0.027 |
| 97NT-2 | 2260°, WQ | None | 1500 | 30,000 | 79.8 | 4.8 | 2.2 | 0.034 |
| | 2260°, WQ | None | 1500 | 30,000 | 99.0 | 5.7 | 4.0 | 0.021 |
| | 2260°, WQ | None | 1500 | 25,000 | 489.0 | 3.1 | 1.3 | 0.0017 |
| | 2200°, WQ | None | 1500 | 25,000 | 310.0 | 4.0 | 1.3 | 0.0078 |
| 99NT-2 | 2260°, WQ | None | 1500 | 30,000 | 109.5 | 4.3 | 1.2 | 0.013 |
| | 2260°, WQ | None | 1500 | 25,000 | 542.4 | 3.2 | 1.8 | 0.0041 (?) |
| | 2200°, WQ | None | 1500 | 25,000 | 412.3 | 3.5 | 2.0 | 0.0028 |
| | 2260°, WQ | None | 1600 | 20,000 | 289.0 | 2.0 | 1.0 | 0.0195 |
| 102NT-2 | 2260°, WQ | None | 1500 | 30,000 | 105.0 | 5.2 | 1.2 | 0.017 |
| | 2260°, WQ | None | 1600 | 30,000 | 17.2 | 6.3 | 4.1 | 0.230 |
| | 2260°, WQ | None | 1600 | 25,000 | 148.0 | 2.8 | 1.2 | 0.012 |
| | 2260°, WQ | None | 1600 | 20,000 | 805.0 | 2.8 | 1.0 | 0.0013 |
| 104NT-2 | 2260°, WQ | None | 1500 | 30,000 | 69.3 | 6.8 | 1.6 | 0.030 |
| | 2260°, WQ | None | 1500 | 30,000 | 100.0[5] | 4.0 | 1.7 | 0.021 |
| | 2260°, WQ | None | 1500 | 20,000 | 2100.0 | 3.3 | 1.2 | 0.00026 |
| 107NT-2 | 2260°, WQ | None | 1500 | 30,000 | 61.0 | 5.6 | 2.4 | 0.033 |
| | 2260°, WQ | None | 1500 | 30,000 | 86.4[5] | 4.8 | 1.6 | 0.028 |
| 112NT-2 | 2260°, WQ | None | 1500 | 30,000 | 85.0[5] | 5.0 | 2.8 | 0.029 |
| 102N-1A | 2260°, WQ | None | 1500 | 30,000 | 70.7 | 4.0 | 1.0 | 0.025 |
| | As cast | None | 1500 | 30,000 | 6.5 | 10.4 | 7.3 | 1.60 |
| 89N-1B | 2250°, WQ | None | 1500 | 30,000 | 39.5 | 4.6 | 1.3 | 0.036 |
| | 2250°, WQ | None | 1500 | 30,000 | 38.0 | 4.0 | 1.0 | 0.036 |
| | 2260°, WQ | None | 1500 | 30,000 | 47.3[5] | 4.0 | 1.7 | 0.046 |
| | As cast | None | 1500 | 30,000 | 10.3 | 14.2 | 7.8 | 1.38 |
| 109N-1B | 2260-½-WQ | None | 1500 | 30,000 | 69.4 | 7.2 | 2.5 | 0.035 |
| | 2260-1-WQ | None | 1500 | 30,000 | 68.0 | 6.4 | 1.7 | 0.063 |
| | 2260-2-WQ | None | 1500 | 30,000 | 43.0 | 5.6 | 2.0 | ..... |
| | 2260°, WQ | None | 1500 | 20,000 | 2240.0 | 3.3 | 1.0 | 0.00008 |
| 121N-1B | 2260°, WQ | None | 1500 | 30,000 | 44.0 | 4.8 | 2.4 | 0.075 |
| | 2260°, WQ | None | 1500 | 30,000 | 72.0[5] | 6.5 | 3.3 | 0.054 |
| | 2260°, WQ | None | 1500 | 30,000 | 92.7 | 5.6 | 2.8 | 0.034 |
| 124N-1B | 2260°, WQ | None | 1500 | 30,000 | 35.2 | 6.5 | 3.5 | 0.154 |
| 128N-1B[4] | 2260°, WQ | None | 1500 | 30,000 | 12.7 | 8.1 | 6.2 | ..... |
| | 2260°, WQ | None | 1500 | 30,000 | 21.0[5] | 8.1 | 5.8 | 0.248 |
| | As cast | None | 1500 | 30,000 | 15.0 | 8.0 | 7.4 | ..... |
| 134N-1B | 2260°, WQ | None | 1500 | 30,000 | 48.2 | 8.8 | 4.8 | 0.091 |
| 106N-1C | 2260°, WQ | None | 1500 | 30,000 | 80.0 | 4.8 | 2.0 | 0.032 |
| | 2260°, WQ | None | 1500 | 25,000 | 377.0 | 4.0 | 1.0 | 0.0028 |
| 107N-1C | 2260°, WQ | None | 1500 | 30,000 | 56.7 | 5.2 | 3.2 | 0.051 |
| | 2260°, WQ | None | 1500 | 30,000 | 52.4[2] | 3.2 | 2.0 | 0.047 |
| | 2260°, WQ | None | 1500 | 30,000 | 53.4 | 4.3 | 1.6 | 0.029 |

TABLE VI—Continued

Rupture Results on Cast Ni-Cr-Co-Fe Base Alloys at 1500° and 1600° F at Stresses from 15,000 to 30,000 Psi

| Alloy | Heat Treatment[1] | Aging Treatment[1] | Temperature, °F | Stress Psi | Hours to Fracture | Elongation, Pct | R. A., Pct | Min Creep Rate, Pct per hr |
|---|---|---|---|---|---|---|---|---|
| 114N-1C | 2260°, WQ | None | 1500 | 30,000 | 32.6[2] | 5.6 | 2.5 | 0.101 |
| 110N-1D | 2260°, WQ | None | 1500 | 30,000 | 105.0 | 5.6 | 1.4 | 0.019 |
| | 2260°, WQ | None | 1500 | 25,000 | 411.3 | 3.3 | 1.0 | 0.0029 |
| | 2260°, WQ | None | 1500 | 25,000 | 364.0 | 3.0 | 0.8 | 0.0026 |
| 111N-1D | 2260°, WQ | None | 1500 | 30,000 | 79.4 | 5.2 | 2.0 | 0.042 |
| | 2260°, WQ | None | 1500 | 30,000 | 62.0[2] | 3.1 | 1.8 | 0.029 |
| | 2260°, WQ | None | 1500 | 25,000 | 349.5 | 2.8 | 1.8 | 0.0021 |
| 115N-1D | 2260°, WQ | None | 1500 | 30,000 | 124.7 | 4.3 | 2.4 | 0.019 |
| | 2260°, WQ | None | 1600 | 20,000 | 257.3 | 4.3 | 1.0 | 0.02 |
| 122N-1D | 2260°, WQ | None | 1500 | 30,000 | 23.0 | 5.6 | 3.6 | ..... |
| 90NT-1B | 2260°, WQ | None | 1500 | 30,000 | 20.3 | 4.8 | 2.4 | ..... |
| | 2260°, WQ | None | 1500 | 30,000 | 35.5 | 5.6 | 4.0 | ..... |
| | 2260°, WQ | None | 1500 | 30,000 | 3.5[2] | .... | .... | ..... |
| 93NT-1B | 2260°, WQ | None | 1500 | 30,000 | 65.3 | 6.2 | 1.8 | 0.045 |
| 94NT-1B | 2260°, WQ | None | 1500 | 30,000 | 72.0 | 6.1 | 2.4 | 0.045 |
| | 2260°, WQ | None | 1500 | 25,000 | 315.0 | 3.0 | 2.0 | 0.0028 |
| | 2260°, WQ | None | 1500 | 25,000 | 365.6 | 3.0 | 1.0 | 0.0056 |
| 99NT-1B | 2260°, WQ | None | 1500 | 30,000 | 154.0[5] | 4.0 | 1.6 | 0.015 |
| | 2260°, WQ | None | 1500 | 30,000 | 50.8[5] | 2.8 | 2.0 | 0.046 |
| | 2260°, WQ | None | 1500 | 25,000 | 200.0[5] | 2.5 | 0.5 | 0.0064 |
| 101NT-1B | 2260°, WQ | None | 1500 | 30,000 | 101.3 | 6.1 | 4.6 | 0.027 |
| | 2260°, WQ | None | 1500 | 30,000 | 97.9 | 6.4 | 2.4 | 0.034 |
| | 2260°, WQ | None | 1600 | 25,000 | 98.0 | 4.8 | 1.6 | 0.021 |
| | 2260°, WQ | None | 1600 | 20,000 | 400.0 | 3.2 | 1.2 | 0.0010 |
| 102NT-1B | 2260°, WQ | None | 1500 | 30,000 | 42.3 | 5.6 | 2.0 | 0.040 |
| | 2260°, WQ | None | 1500 | 30,000 | 50.0 | 4.0 | 2.0 | 0.042 |
| | 2260°, WQ | None | 1500 | 30,000 | 89.8 | 4.4 | 3.1 | 0.019 |
| 103NT-1B | 2260°, WQ | None | 1500 | 30,000 | 27.7 | 3.2 | 2.4 | ..... |
| 111NT-1B | 2260°, WQ | None | 1500 | 30,000 | 34.6[2] | 4.0 | 2.0 | ..... |
| | 2260°, WQ | None | 1500 | 30,000 | 18.5[2] | <2.0 | .... | ..... |
| | 2260°, WQ | None | 1500 | 30,000 | 9.5[2] | <1.0 | .... | ..... |
| 115NT-1B | 2260°, WQ | None | 1500 | 30,000 | 60.1 | 7.5 | 4.5 | 0.085 |
| | 2260°, WQ | None | 1500 | 25,000 | 200.0 | 4.0 | 2.0 | 0.011 |
| | 2260°, WQ | None | 1500 | 25,000 | 294.8 | 3.5 | 1.6 | 0.0036 |
| 124NT-1B | 2260°, WQ | None | 1500 | 30,000 | 41.0 | 7.2 | 5.2 | 0.126 |
| | 2260°, WQ | None | 1500 | 30,000 | 27.3[5] | 7.0 | 5.7 | 0.204 |
| | 2260°, WQ | None | 1500 | 25,000 | 209.0 | 4.6 | 3.1 | 0.015 |

[1] All temperatures in °F
[2] Failure occurred in the fillet section
[3] Heat was cast into a mold preheated to 2250°F
[4] Heat was cast into a mold held at room temperature
[5] Specimen highly polished prior to testing instead of testing with as-cast and sandblasted surface

were cooled over a range from water quenching to ash cooling. Microstructures also failed to reveal a generally conclusive case but did indicate that a more or less continuous second phase—the brittle carbide and/or nitride—was abundantly present.

The compositions were investigated and are shown in table XI. Note that all the alloys contain tantalum plus columbium from 6.01 to 9.32 pct. Both of these elements are very strong carbide and nitride formers and it is the presence of these brittle phases when of a continuous nature in the austenite matrix which causes failure during forging by acting as points of origin of cracks and high stress zones.

It is worth noting that neither cobalt nor tungsten in combination with any other element in these alloys seems to show any harmful effects in view of the fact that alloy TB, with cobalt plus tantalum, and TC, with cobalt plus columbium, are forgeable; and alloys TE and TF, with W plus Ta, and W plus Cb respectively, are also readily forgeable.

To check the effect of the Ta and Cb factor a 6-lb ingot was made of an alloy similar in all respects to nonforgeable Ta and TAA except that it contained only 3.70 combined pct of Ta plus Cb. This alloy proved to be forgeable. Subsequently other alloys with combined Ta plus Cb up to 4.0 pct proved to be forgeable (alloys MT-14 with 4.06 pct, MT-11A with 3.24 pct, and MT-10 with 2.62 pct). Forgeable alloys with greater than 4.0 pct of either alloying element alone are forgeable, however; for example, MT-12, TE-T, TE-OA.

Thus it is quite clearly shown that the presence of greater than 4.0 pct but certainly 5.0 pct of combined Ta plus Cb should be avoided in trying to produce a forgeable product where nitrogen and carbon are present in the amounts encountered in these alloys.

Several other alloys were found unforgeable but these contained carbon greater than 0.35 pct and in certain instances titanium, both of which appear to make forging impractical. Carbon contents greater than 0.40 pct in these types of alloys (high content of carbide and nitride forming elements) can safely be assumed to be nonforgeable.

A limited number of alloys were made of the same composition in both the forged and cast condition. Where available for comparison they indicate that the forged alloy presents a superior product with regard to ductility while the cast products show superior strength with decreased ductility. All the

## TABLE VIII

### List of Vitallium Base Cast Alloys

### V-2 Series

(Unless otherwise indicated, the analyses are the same for the entire series, as shown by the first in each group.)

| Alloy | C | $N_2$ | Cr | Co | Mo | Others |
|---|---|---|---|---|---|---|
| 84V-2 | 0.84 | ..... | 23 | 69 | 6 | None |
| 89V-2 | 0.89 | ..... | .. | .. | .. | .... |
| 90V-2 | 0.90 | ..... | .. | .. | .. | .... |
| 93V-2 | 0.93 | 0.064 | .. | .. | .. | .... |
| 94V-2 | 0.94 | ..... | .. | .. | .. | .... |
| 110V-2 | 1.10 | ..... | .. | .. | .. | .... |
| 112V-2 | 1.12 | ..... | .. | .. | .. | .... |
| 116V-2 | 1.16 | ..... | .. | .. | .. | .... |
| 127V-2 | 1.27 | ..... | .. | .. | .. | .... |
| 133V-2 | 1.33 | ..... | .. | .. | .. | .... |
| 134V-2 | 1.34 | ..... | .. | .. | .. | .... |
| 147V-2 | 1.47 | ..... | .. | .. | .. | .... |

### V-1 Series

| Alloy | C | $N_2$ | Cr | Co | Mo | Others |
|---|---|---|---|---|---|---|
| 82V-1 | 0.82 | 0.118 | 23 | 62 | 6 | 6 Fe (0.15 $N_2$ added) |
| 114V-1 | 1.14 | * | 23 | 69 | 6 | ($N_2$ gas bubbled in) |
| 118V-1 | 1.16 | 0.086 | 23 | 68 | 6 | (0.04 $N_2$ added) |

### VN Series

| Alloy | C | $N_2$ | Cr | Co | Mo | Others |
|---|---|---|---|---|---|---|
| 104VN2-2 | 1.04 | ..... | 23 | 67 | 6 | 2 Ni |
| 95VN8-2 | 0.95 | ..... | 23 | 61 | 6 | 8 Ni |

### VT Series

| Alloy | C | $N_2$ | Cr | Co | Mo | Others |
|---|---|---|---|---|---|---|
| 40VT2-2 | 0.40 | ..... | 23 | 67 | 6 | 2 Ta |
| 70VT2-2 | 0.70 | ..... | .. | .. | .. | .... |
| 77VT2-2 | 0.77 | ..... | .. | .. | .. | .... |
| 91VT2-2 | 0.91 | ..... | .. | .. | .. | .... |
| 95VT2-2 | 0.95(No. 1) | ..... | .. | .. | .. | .... |
| 95VT2-2 | 0.95(No. 2) | ..... | .. | .. | .. | .... |
| 96VT2-2 | 0.96 | ..... | .. | .. | .. | .... |
| 99VT2-2† | 0.99 | ..... | .. | .. | .. | .... |
| 100VT2-2†† | 1.00 | ..... | .. | .. | .. | .... |
| 101VT2-2 | 1.01 | ..... | .. | .. | .. | .... |
| 102VT2-2* | 1.02 | ..... | .. | .. | .. | .... |
| 103VT2-2** | 1.03 | ..... | .. | .. | .. | .... |
| 111VT2-2 | 1.11 | 0.062 | .. | .. | .. | .... |
| 113VT2-2 | 1.13 | ..... | .. | .. | .. | .... |
| 117VT2-2 | 1.17 | ..... | .. | .. | .. | .... |
| 120VT2-2 | 1.20 | ..... | .. | .. | .. | .... |
| 125VT2-2 | 1.25 | ..... | .. | .. | .. | .... |
| 117VT4-2 | 1.17 | ..... | 23 | 65 | 6 | 4 Ta |

### Other Alloys

| Alloy | C | $N_2$ | Cr | Co | Mo | Others |
|---|---|---|---|---|---|---|
| 85VB-2 | 0.85 | ..... | 23 | 67 | 6 | 0.5 Boron added as FeB |
| 97VZ2-2 | 0.97 | ..... | 23 | 67 | 6 | 2 Zr |
| 109VW2-2 | 1.09 | ..... | 23 | 67 | 6 | 2 W |

† Mold temperature at 1500°F
†† Mold temperature at 2250°F
* Fine tungsten powder spray applied to wax pattern before investing
** Mold temperature at 75°F (room temperature)

tests are compared at 20,000 psi and 1500° F. Table XII shows the comparison.

Alloy TE-OB shows the smallest difference in microstructure in a comparison of the cast and forged grades and accordingly shows the smallest difference in properties. On the other hand, MT-9 shows vastly different as-cast and as-forged structures; accordingly there is a large difference in the ductility and rupture life. Alloy S-497 also shows a very large difference in cast and forged test values. It appears, therefore, that a readily forgeable material, one with a minimum of the brittle carbide and nitride second phase, would naturally show the least change in structure in going from the cast to the forged condition—alloys TE, N-155 (or its equivalent 30P-2). Accordingly there cannot be expected any great change in properties in using either the cast or forged product, although the as-cast alloy will show somewhat less ductility. Materials such as MT-9, S-497 (equivalent is cast 40S-2) which show considerable amounts of the brittle second phase in the cast structure will forge with much less ease, and the forged structures will show better ductility but shorter rupture life than the cast alloy.

Eventually as the volume and continuity of the second phase increase, forgeability falls to zero and only the cast alloy is applicable. This brittle second phase is increased by carbon, nitrogen and combinations of carbide and nitride forming elements.

Higher strength will thus be found in the cast alloys containing the necessary amount of carbide, nitride, etc., phases properly distributed for attaining strength, whereas if high ductility alloys are desired, the forgeable alloys appear to present the better choice by far.

### Ni-Cr-Co-Fe Base Alloys

Effect of solution treatment and temperature—it became apparent shortly after the start of the program that the effect of heat treating this type of alloy was very important. Metallographic evidence was not too encouraging, but stress rupture results showed large variations with heat treatment, both insofar as temperature and quenching media are concerned.

An extremely large increase in strength may be obtained at the expense of the ductility by properly heat treating these types of alloys.

The need for a solution heat treatment was based on a comparison of as-cast properties against those of the same alloys solution treated. It was found in all cases that an increase in strength was obtained with an increase in solution temperature, up to certain limits. Also, each alloy in this group shows, without exception, that as the solution temperature rises, the rupture life increases while the ductility decreases. This is true for any stresses from 15,000 to 30,000 psi.

However, and this is important, a certain temperature is finally reached, just shortly before melting takes place, at which point recrystallization takes place. Once an alloy reaches this recrystallization temperature both its strength and ductility drop off very suddenly to practically zero values. The fracture which accompanies this change is extremely coarser-grained and irregular. In the forged grades (low carbon types) this recrystallization temperature

## TABLE IX

### Stress Rupture Test Results at 1500° and 1600°F for Various Stresses for Vitallium Type Alloys

| Alloy | Heat Treatment[1] | Aging Treatment[1] | Temperature, °F | Stress, Psi | Rupture Time, Hr | Elongation, Pct | R. A. Pct | Minimum Creep, Pct per hr |
|---|---|---|---|---|---|---|---|---|
| 84V-2 | As cast | None | 1500 | 30,000 | 82.8 | 15.3 | 9.3 | 0.048 |
| 93V-2 | As cast | None | 1500 | 30,000 | 118.5 | 13.6 | 6.9 | 0.045 |
| | As cast | None | 1500 | 25,000 | 457.5 | 11.9 | 7.3 | 0.026 |
| | As cast | None | 1600 | 20,000 | 421.3 | 8.0 | 5.3 | 0.014 |
| 94V-2 | As cast | None | 1500 | 30,000 | 197.0 | 10.4 | 4.8 | 0.025 |
| | As cast | None | 1500 | 25,000 | 900.5 | 6.5 | 2.8 | 0.0039 |
| | As cast | None | 1600 | 25,000 | 101.0 | 9.5 | 5.3 | 0.047 |
| 110V-2 | As cast | None | 1500 | 30,000 | 138.1 | 15.3 | 9.7 | 0.049 |
| | As cast | None | 1500 | 30,000 | 176.0 | 10.5 | 5.2 | ..... |
| 112V-2 | As cast | None | 1500 | 30,000 | 90.6 | 15.3 | 6.5 | 0.112 |
| | As cast | None | 1500 | 30,000 | 127.1 | 13.6 | 7.0 | 0.065 |
| 116V-2 | As cast | None | 1500 | 30,000 | 228.3 | 6.5 | 2.4 | 0.016 |
| | As cast | None | 1500 | 25,000 | 425.0 | 12.1 | 5.3 | 0.012 |
| | As cast | None | 1600 | 25,000 | 138.3 | 11.3 | 6.1 | 0.039 |
| 127V-2 | As cast | None | 1500 | 30,000 | 372.0 | 8.8 | 2.0 | 0.013 |
| | As cast | None | 1500 | 25,000 | 535.0 | 9.1 | 4.0 | ..... |
| | As cast | None | 1500 | 25,000 | 543.7 | 8.5 | 2.8 | 0.0069 |
| | As cast | None | 1600 | 20,000 | 347.3 | 10.2 | 6.8 | ..... |
| 134V-2 | As cast | None | 1500 | 30,000 | 74.0 | 13.7 | 10.8 | ..... |
| | As cast | None | 1500 | 30,000 | 62.4 | 12.8 | 9.0 | ..... |
| 147V-2 | As cast | None | 1500 | 30,000 | 192.0 | 12.0 | 5.1 | 0.034 |
| | As cast | None | 1500 | 25,000 | 658.5 | 13.3 | 5.7 | 0.0082 |
| | As cast | None | 1600 | 20,000 | 724.7 | 11.0 | 7.3 | 0.0079 |
| 82V-1 | As cast | None | 1500 | 30,000 | 14.0 | 17.7 | 11.5 | ..... |
| | 2260°, WQ | None | 1500 | 30,000 | 0.0 | Broke while loading | | |
| | As cast | None | 1500 | 30,000 | 25.0 | 8.0 | 5.7 | ..... |
| 110V-1 | As cast | None | 1500 | 30,000 | 150.0 | 13.7 | 6.5 | 0.033 |
| | As cast | None | 1500 | 30,000 | 130.5 | 11.0 | 5.3 | ..... |
| | As cast | None | 1500 | 30,000 | 95.4 | 8.7 | 4.9 | ..... |
| 116V-1 | As cast | None | 1500 | 30,000 | 138.7 | 12.9 | 5.3 | 0.093 |
| | As cast | None | 1500 | 30,000 | 277.0 | 10.2 | 4.9 | 0.018 |
| | As cast | None | 1600 | 25,000 | >60.0 | Clock not registering | | |
| | As cast | None | 1600 | 25,000 | 78.4 | 15.3 | 8.9 | 0.037 |
| 104VN2-2 | As cast | None | 1500 | 30,000 | 76.9[2] | 8.0 | ... | ..... |
| | As cast | None | 1500 | 30,000 | 185.5 | 8.5 | 2.0 | 0.038 |
| | As cast | None | 1500 | 30,000 | 200.0 | 5.3 | 3.6 | 0.015 |
| 95VN8-2 | As cast | None | 1500 | 30,000 | 34.7 | 8.8 | 3.6 | ..... |
| | As cast | None | 1500 | 30,000 | 51.4 | 11.9 | 7.6 | 0.144 |
| 40VT2-2 | As cast | 50 hr, 1500° | 1500 | 30,000 | 44.0 | 6.5 | 4.0 | ..... |
| | As cast | None | 1500 | 30,000 | 27.4 | 8.1 | 4.0 | ..... |
| | 2300°, FC | None | 1500 | 30,000 | 10.6 | 7.2 | 2.8 | ..... |
| 70VT2-2 | As cast | None | 1500 | 30,000 | 47.5 | 8.1 | 4.9 | ..... |
| | As cast | None | 1500 | 30,000 | 58.3 | 12.7 | 7.3 | 0.087 |
| 77VT2-2 | As cast | None | 1500 | 30,000 | 45.5[2] | 7.2 | 5.7 | 0.093 |
| | As cast | None | 1500 | 30,000 | 57.2 | 8.1 | 4.4 | 0.092 |
| | As cast | None | 1500 | 30,000 | 77.0 | 14.7 | 8.0 | ..... |
| 91VT2-2 | As cast | None | 1500 | 30,000 | 180.0 | 7.9 | 4.1 | 0.032 |
| | As cast | 42 hr, 1500° | 1500 | 30,000 | 174.3 | 15.3 | 8.6 | 0.035 |
| 95VT2-2 | 2300°, air cool | 50 hr, 1500° | 1500 | 30,000 | 23.0 | 2.4 | 0.5 | ..... |
| | 2000°, FC | None | 1500 | 30,000 | 37.0 | 18.4 | 11.7 | 0.250 |
| | 2100°, FC | None | 1500 | 30,000 | 48.6 | 16.8 | 11.2 | 0.196 |
| 98VT2-2 | As cast | None | 1500 | 30,000 | >175.0 | Poor temperature control | | |
| 99VT2-2[2] | As cast | None | 1500 | 30,000 | 62.7 | 10.4 | 6.1 | ..... |
| | As cast | None | 1500 | 30,000 | 109.5 | 6.4 | 4.1 | ..... |
| 107VT2-2[4] | As cast | None | 1500 | 30,000 | 115.0 | Poor temperature control | | |
| | As cast | None | 1500 | 30,000 | 244.9 | 6.5 | 4.1 | 0.015 |
| | As cast | None | 1500 | 30,000 | 168.6 | 6.3 | 3.6 | ..... |
| 121VT2-2 | As cast | None | 1500 | 30,000 | 220.0 | 7.8 | .... | ..... |
| | As cast | None | 1500 | 30,000 | 217.0 | 7.9 | 3.6 | 0.025 |
| | 2200°, FC | None | 1500 | 30,000 | 66.0 | 6.4 | 0.5 | 0.018 |
| | 2300°, FC | None | 1500 | 30,000 | 78.3 | 1.6 | 0.8 | 0.006 |
| 102VT-2[5] | As cast | None | 1500 | 30,000 | 103.8 | 10.4 | 4.5 | 0.043 |
| | As cast | None | 1500 | 30,000 | 113.0 | 7.1 | 4.1 | 0.032 |
| 103VT2-2[6] | As cast | None | 1500 | 30,000 | 20.2[2] | 4.9 | .... | ..... |
| | As cast | None | 1500 | 30,000 | 39.2[2] | 3.2 | .... | ..... |
| 111VT2-2 | As cast | None | 1500 | 30,000 | 297.3 | 8.3 | 3.7 | 0.013 |
| | As cast | None | 1500 | 25,000 | 1093.4 | 6.5 | 2.0 | 0.0035 |
| | As cast | None | 1600 | 25,000 | 122.2 | 6.8 | 3.2 | 0.031 |
| | As cast | None | 1600 | 20,000 | 960.0 | 8.9 | 2.0 | 0.0027 |
| 113VT2-2 | Tests excluded due to great many sand inclusions present | | | | | | | |
| 120VT2-2 | As cast | None | 1500 | 30,000 | 159.2 | 7.3 | 4.5 | 0.040 |
| | As cast | None | 1600 | 25,000 | 78.6 | 7.3 | 6.9 | 0.060 |
| | As cast | None | 1600 | 25,000 | 141.6 | 10.5 | 7.6 | 0.060 |
| 125VT2-2 | As cast | None | 1500 | 30,000 | 152.0 | 7.9 | 3.7 | 0.021 |
| | As cast | None | 1500 | 30,000 | 247.5 | 7.1 | 2.5 | 0.018 |

## TABLE IX Continued

### Stress Rupture Test Results

| Alloy | Heat Treatment[1] | Aging Treatment[1] | Temperature, °F | Stress, Psi | Rupture Time, Hr | Elongation, Pct | R. A., Pct | Minimum Creep, Pct per hr |
|---|---|---|---|---|---|---|---|---|
| 117VT4-2 | As cast | None | 1500 | 30,000 | 150.0 | Poor temp | erature control | |
| | As cast | None | 1500 | 30,000 | 195.2 | 7.2 | 3.6 | 0.017 |
| | As cast | None | 1500 | 25,000 | 444.6 | 7.0 | 4.5 | 0.0062 |
| | As cast | None | 1600 | 25,000 | 161.5 | 8.0 | 4.5 | 0.027 |
| | As cast | None | 1600 | 20,000 | 801.1 | 6.8 | 1.2 | 0.0061 |
| 85VB-2 | As cast | None | 1500 | 30,000 | 107.5 | 13.5 | 8.3 | 0.068 |
| | As cast | None | 1500 | 30,000 | 131.5 | 13.8 | 8.2 | 0.078 |
| 97VZ2-2 | As cast | None | 1500 | 30,000 | 95.9 | 7.2 | 5.2 | 0.027 |
| | As cast | None | 1500 | 30,000 | 83.3 | 8.8 | 7.7 | 0.087 |
| | As cast | None | 1600 | 25,000 | 160.0 | 12.9 | 7.6 | 0.043 |
| | As cast | None | 1600 | 20,000 | 803.0 | 4.7 | 4.0 | 0.0037 |
| 109VW2-2 | As cast | None | 1500 | 30,000 | 122.7 | 8.8 | 5.1 | 0.035 |
| | As cast | None | 1500 | 30,000 | 86.3 | 10.4 | 2.6 | 0.065 |

[1] All temperatures in °F
[2] Broke in fillet
[3] Heat was cast into a mold whose temperature was 1500°F
[4] Heat was cast into a mold whose temperature was 2250°F
[5] Wax pattern was sprayed with tungsten powder before investing
[6] Heat was cast into a mold which was at room temperature

appears to be just above 2300°F. In the cast alloys—higher carbon grades almost exclusively—this recrystallization temperature is below 2300°F and is closer to 2280° F in most cases. An inspection of table VI, which lists the rupture properties of the cast Ni-Cr-Co-Fe base alloys shows that there are quite a few alloys listed which indicate this behavior; notice 30TA-1, 17TA-1, 18TD-1, 42MT9-1, 87N-2, 123M-1, etc.

A large range of properties can thus be achieved by varying the heat treatment of these alloys to get different combinations of strength and ductility at high temperatures. With the normal temperature control found in standard commercial furnaces it is wise to work with solution temperatures at least 20° F below the recrystallization temperature, for example at 2260° F.

Tests also indicate that solution time at temperature need not exceed ½ hr for the 0.250 and 0.505-in. diam specimens. No improvement is noted in holding a sample 1 hr as compared to ½ hr and a holding time of 2 hr appears somewhat damaging, although one single test only was made in this connection. Note the results attained with alloy 109N-1B in Table VI.

## TABLE X

### Creep Test Results at 1500°F and Various Stresses

| Alloy | Heat Treatment | Aging Treatment | Load, Psi | Total Creep | | Minimum Creep Rate | |
|---|---|---|---|---|---|---|---|
| | | | | Hours | Elong., in. per in. | Hr | Pct per hr |
| 111VT2-2 | As cast | None | 13,500 | 2000 | 0.00192 | 800-2000 | 0.000034 |
| 111VT2-2 | As cast | None | 12,000 | 2020 | 0.00170 | 700-2000 | 0.000037 |
| 116V-1 | As cast | None | 13,500 | 2020 | 0.00330 | 600-2000 | 0.000091 |
| 127V-2 | As cast | None | 13,500 | 2320 | 0.00360 | 800-2300 | 0.000078 |

## TABLE XI

### Compositions of Low Carbon Nonforgeable Alloys

| Alloy | C | Mn | Si | $N_2$ | Ni | Cr | Co | Mo | Ta | Cb | W | Ta + Cb |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TA | 0.10 | 0.7 | 1 | 0.143 | 30 | 20 | .... | 6 | 2.97 | 5.10 | .... | 8.07 |
| TA | 0.09 | 0.7 | 1 | 0.15 | 30 | 20 | .... | 6 | 4.07 | 5.25 | .... | 9.32 |
| TAA | 0.10 | 0.7 | 1 | 0.15 | 30 | 20 | .... | 6 | 1.92 | 4.10 | .... | 6.02 |
| TD | 0.12 | 0.7 | 1 | 0.15 | 30 | 20 | 18 | 6 | 2.75 | 4.20 | .... | 6.95 |
| TG | 0.09 | 0.7 | 1 | 0.15 | 30 | 20 | .... | 4 | 1.97 | 4.04 | 4 | 6.01 |

## TABLE XII

### Properties of Cast v. Forged Alloys at 1500°F and 20,000 psi in the Ni-Cr-Co-Fe Base Systems

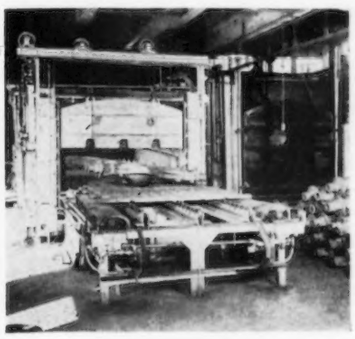
| Forged Alloy | Heat Treatment, °F | Elong., Pct | Hours to Fracture | Cast Alloy | Heat Treatment, °F | Elong., Pct | Hours to Fracture |
|---|---|---|---|---|---|---|---|
| TE-OB | 2300°, WQ | 8.8 | 39.6 | 13TEOB-1 | 2300°, WQ | 10.0 | 42.0 |
| MT-9 | 2200°, WQ | 11.7 | 27.0 | 42MT9-1 | 2250°, WQ | 4.6 | 204.6 |
| N-155 | 2200°, WQ | 18.0 | 115.0 | 30P-2 | 2250°, WQ | 8.0 | 155.0 |
| S-497 | 2250°, WQ | 24.0 | 43.5 | 40S-2 | 2250°, WQ | 8.9 | 174.5 |

# New Equipment . . .

## Heat Treating

***Developments in various types of heat treating furnaces, including pusher-tray, dual purpose, portable, high and low temperature units, are described in this week's digest. Carburizers, atmosphere controllers, and a quenching press are also included in the review.***

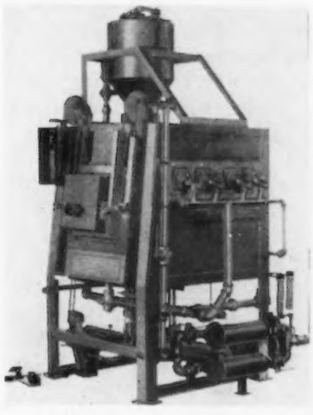
A PUSHER-TRAY furnace for uniform heating and cooling has been designed by *W. S. Rockwell Co.*, 200 Eliot St., Fairfield, Conn., to heat treat large cast



steel truck rear axle housings. It is said to assure identical processing under controlled conditions to each casting. The furnace will heat the castings to 1650°F, hold them at that temperature for one hour and then discharge them on an individual tray to enable them to cool uniformly in still air. Every 12 min one tray containing its load enters the heating zone of the furnace and one casting is discharged, the total normalizing time being 48 min in the heating zone, and 60 min in the holding zone. The heating chamber is approximately 15 ft long x 6 ft 5 in. wide, with the higher heating zone being at the charging end. A series of proportioning mixer type gas burners fire from both sides of the furnace above and below the work line, providing, it is claimed, fine heat distribution and eliminating any areas of high heat density. The heat input for each zone is automatically controlled by separate recording potentiometer pyrometers. The work progresses through the furnace on cast grid type trays moving on three roller type rails. The castings for which this furnace was designed are 64 to 66 in. long, each weighing approximately 350 lb. The furnace may also be used for normalizing on trays miscellaneous steel and alloy steel castings such as pump bodies, valve bodies, cylinders.

### Dual Purpose Furnace

FOR increased flexibility in handling different batch type heat treating operations, an atmosphere muffle furnace has been offered by *Surface Combusion Corp.*, Toledo 1. The furnace can produce the proper atmosphere for gas carbur-



izing, as well as perform general heat treating. Features include atmosphere and uniform temperature distribution. Conversion from a carburizing to a heat treating atmosphere and vice versa can quickly be made, it is claimed, without shutting down. Nor is it necessary to shut down for filter cleaning, since a twin filter unit is supplied. For rapid heating the furnace is equipped with over-muffle and under-muffle burners. The time to temperature ranges from 2½ to 3 hr. A double door facilitates handling pieces of various sizes with minimum loss of atmosphere. Both doors are of air-lift type, operated by a tilting treadle with manual selector. The basic atmosphere gas for the furnace is made by reacting carbon with air in a generator built into the furnace so that the gas is formed at furnace temperature. A small portion of the generated gas thus formed is bled from the hopper to eliminate from the charcoal all moisture and volatile products before it is used.

### Quenching Press

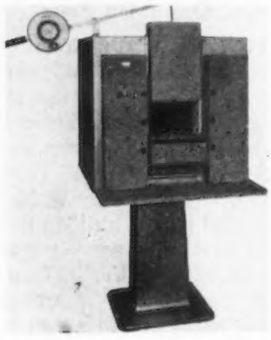
DESIGNED for holding and quenching heated gears and other parts so that they may be hardened without distortion, a quenching press has been produced by the *Gleason Works*, 1000 University Ave., Rochester 3, N. Y. It is equipped with a built-in pumping system and oil reservoir which is said to reduce the external oil supply required to approximately 35 gpm, while providing an oil flow through the quenching die as high

as 225 gpm. The volume and rates of flow of the quenching oil are automatically set by controls placed at the front of the machine. The

part is clamped against distortion on a fixed lower die before the quench, and quenching consists of forcing the oil uniformly over and around the part. A sliding lower die mechanism which automatically swings out from under the upper die enables safe, quick and easy changing of the work and dies. The press is designed for oil quenching only and is air-operated. It will handle parts with outside diameters up to 15 in., with production capacity ranging from 10 to 120 pieces per hour. Dies can be supplied for hardening bevel, hypoid, and spur gears, liners, bearing races, disks, and various other parts of symmetrical and nonsymmetrical shape.

### Hardening Furnace

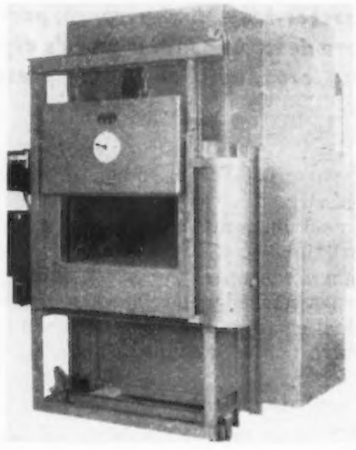
A HIGH speed steel hardening furnace has been added to the model Y line of electric metal heat treating furnaces manufactured by the *Sentry Co.*, Foxboro, Mass. This model is known as size No. 5 and has a mufflle changer 7 in. high x 8⅞ in. wide x 20 in. deep. Through



use of larger sizes of diamond blocks, high speed steel tools up to 5 x 7 x 14 in. maximum size can be hardened, it is said, completely free from scale or decarburization. In this new furnace, heating elements are located front to rear alongside the removable mufflle chamber. Heating element terminals are the same air cooled type as used on other model Y furnaces. The heating chamber is designed to reflect heat toward the muffle chamber opening to offset the tendency to cool at this point. Terminals and electrical connections are shielded and protected by removable metal guards. The furnace is rated at 42 kw maximum and can be directly connected to 220 v, 3-phase supply without a transformer. Overall dimensions of the furnace mounted on a cast iron pedestal, and not including the door lever arm, are 36 in. wide, 48 in. deep and 68 in. high with the hearth 46 in. above the floor.

### Portable Furnace

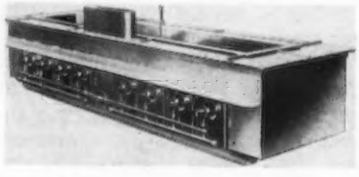
DESIGNED for preheating magnesium sheets before pressing and forming, a portable furnace has been developed by the



*Despatch Oven Co.*, 619 S. E. Eighth St., Minneapolis 14. By introducing heat into the furnace from the top and the bottom and with recirculating ducts on both side walls, it is claimed uniformity of within ± 5°F is obtained. This system allows even heating of the sheet whether in a flat condition or in a partially formed shape in event the entire forming operation can not be completed in one press operation. Fast operating vertical lift doors at each end of the furnace permit rapid handling of the sheets in order to prevent cooling before forming. By having a fan of large capacity, over 40 air changes per min are obtained in the furnace. Large easy rolling casters are provided to move the unit from one press brake to another as operations demand.

### Bath Pot Furnaces

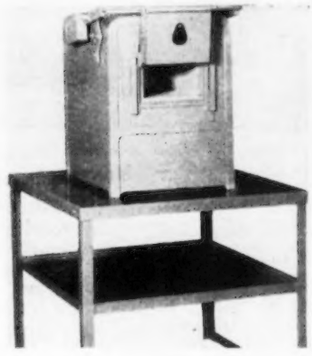
LOW temperature fire tube bath pot furnaces capable of holding a narrow temperature control



band have been announced by *Don C. Campion Laboratories*, 9086 Alpine Ave., Detroit 4. These units are adaptable for oil or salt-draw furnaces, tinning, babbiting, lead dipping and other operations up to 1200°F. The furnaces are heated by burning the gas-air mixture in a fire tube submerged in the bath to be heated, thus giving extreme sensitivity to temperature control by eliminating the thermal head common to refractory-lined combustion chambers. The hot products of combustion envelop the exterior of the bath pot on their way around to the exhaust port. This principle assures approximately 70 pct thermal efficiency which also contributes to cooler conditions in the area surrounding the pot. There are no fans, blowers, mixers, regulators, or other complex accessories. Installation consists of merely connecting to a gas line, and furnaces can be built in most any size and shape.

### Small Electric Furnaces

TWO optional features have been added to mufflle type electric furnaces manufactured by the *Cooley Electric Mfg. Corp.*, Shelby and Dale St., Indianapolis, for heat

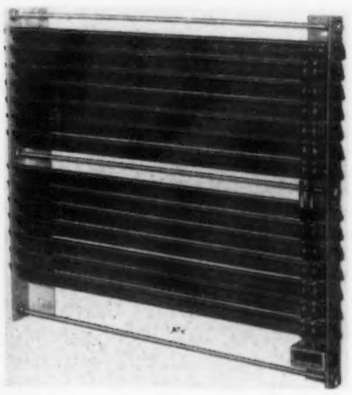


treating tools, dies and small parts, also for laboratory testing. The standard furnace, manufactured with a hinged door which, when opened, forms a loading shelf, is now offered in an alternate design incorporating a counter-weighted vertically operated door for use where only partial door opening to the furnace is required. Furnaces are manufactured in two standard sizes, the MH-3 with chamber dimensions of 8 in. wide x 6 in. high x 14 in. long, and the MH-4 with dimensions of 10 in. wide x 6 in. high x 18 in. long, for continuous operation at 1750°F or intermittent operation at 1850°F. Heating elements are removable and replaceable when necessary. Heating time to 1400°F is approximately 40 min; to 1850°F, 55 to 65 min. These

furnaces are usually operated with an indicating controlling pyrometer. They may also be used for other operations, such as drawing, tempering, normalizing, annealing, and preheating for high-speed hardening. The second new feature is a heavy gage structural steel stand of welded construction which serves as a bench for the furnace and provides a shelf for storage space.

### Oven Heater

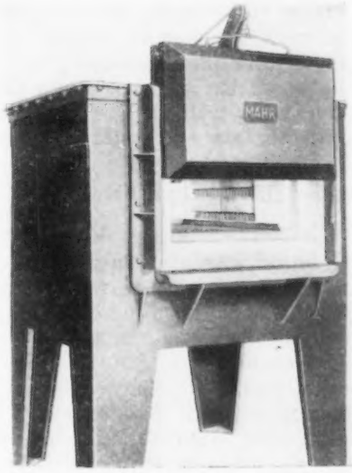
AN oven heater, known as the Chromalox, type NOU modified, developed to operate at oven temperatures up to 950°, has been announced by *Edwin L. Wiegand Co.*, 7532 Thomas Blvd., Pittsburgh 8. Heating element terminals are centralized at one end of the assembly, and all electrical connections are brought to a single enclosed terminal box to simplify wiring. The assembly consists of 14 high temperature chrome steel sheathed strip heaters, giving a



combined rating of 8 kw at 230 v. End brackets are punched to permit mounting to either walls or bottom of the oven. When heaters are mounted on the walls, the strip heater elements are mounted in the end bracket at a slight angle to encourage air circulation. Little change in the position of the strips is necessary in applications where forced air circulation is employed. The oven heater, designed to provide high heating capacity in a small space, is 33½ in. long, 28 in. high and 3 in. deep. Physical dimensions and electrical rating may be altered to suit specific requirements. The heaters are furnished for single phase operation, only.

### Electric Heat Treater

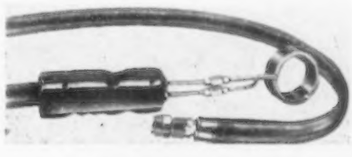
AN electric heat treater for heat treating processes to 2000°F has been announced by the *Mahr Mfg. Co.*, 1703 N. Second St., Minneapolis 11. Built in various standard overall sizes up to 54 x 102 x




88 in., the unit is said to harden carbon and alloy steels to 1850°F, temper heat treated parts, anneal, normalize or preheat high speed steels. It is also offered as a furnace for experimental and development work, available with or without protective atmosphere.

### Portable Induction Heater

USE of induction heating with somewhat the same flexibility as the old-fashioned soldering iron or oxyacetylene torch is now possible, it is said, by means of the flexible lead and coil setup developed by the *Induction Heating Corp.*, 389 Lafayette St., New York 3. The heating coil, mounted on a convenient grip-type handle and connected to a standard Thermonic output transformer by specially designed flexible leads can be brought to the work, making possible induction heating of many bulky assemblies which previously did not lend



themselves to induction heating. Suitable for both heat treating and brazing, this coil may be used in annealing such sections as the ends of large shafts and in brazing large, tubular steel assemblies. The heating coils can be either single or multi-turn coils, although the single-turn inductors limit the amount of power which may be transferred into the work. By use of the transformer, the terminal voltage of the coil is reduced to such a value as to minimize the danger of arc-over to the work, and any hazard to the operator.

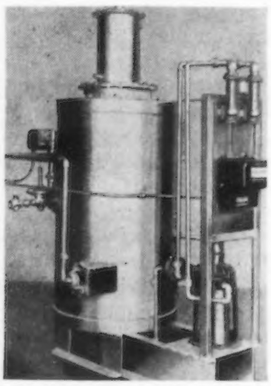
### High Temperature Furnace

KNOWN as the Hi-Temp furnace, a small capacity high temperature furnace has been designed by the *K. H. Huppert Co.*, 6830 Cottage Grove Ave., Chicago 37, to meet the need for precision treating of high speed steel reamers, cutters, tools, etc. This furnace is recommended by the company for continuous operating temperatures up to 2200°F, intermittent to 2250°F. Floor and table models are available, both being furnished with automatic temperature control and featuring multi-insulation; high temperature alloy elements; on-off switch; and two pilot lights,

one for indicating that furnace is operating and the other serving as a safety light to indicate any failure occurring in heating elements. They are of all-steel, heavy-duty construction, with a counterbalanced door and a black wrinkle finish. The furnaces, delivered ready for operation by merely connecting the line to the outlet box provided, operate on 110 v, ac only, with 2 kw current consumption. Inside dimensions of floor and table models are 5½ in. wide x 3⅝ in. high x 6 in. deep (3½ in. throat additional). The floor model is equipped with two steel shelves for storage.

### Gas Cracking Unit

SUPPLIED with a catalyst and used in conjunction with heat treating furnaces to provide a protective, inert atmosphere that is effective in temperatures ranging upward of 2450°F, a gas cracking unit has been announced by *Bellevue*



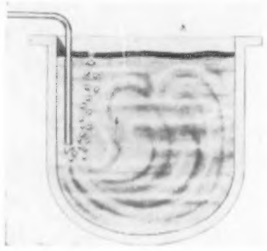
*Industrial Furnace Co.*, 2971 Bellevue Ave., Detroit 7. The atmosphere generating equipment consists of a gas cracker unit, with necessary controls such as pyrometers, floscopes, fire traps, automatic valves. A motor-driven Selas machine supplies any air-gas ratio desired. Natural fuel gas at 100 Btu per cu ft is employed, although manufactured gas can also be used. The gas cracker unit consists of a high nickel alloy steel retort (SAE 3515), heated externally by a small furnace built around it. The retort, in which are a quantity of high-temperature porous refractory cubes impregnated with a special catalyst, is operated at a normal temperature of 1830°F. The heat of the retort assures, it is said, complete combustion of the mixture and the catalyst effects the reaction which produces the controlled atmosphere. This is passed through a short cooling tower to lower the temperature to 250° to 300°F, before feeding it into the furnace muffle.

### Maintenance Refractory

A ZIRCONIUM silicate base refractory, known as Zircoat-M, has been developed by *Basic Refractories, Inc.*, 845 Hanna Bldg., Cleveland. This fine grain material is mixed with water and upon application with a spray gun sets up rapidly to form a hard, dense working surface that will withstand high furnace operating temperatures and unusual furnace conditions. It has been used as a protective coating on silicon carbide, fire-clay, sillimanite, mullite, silica and other acid type refractories. Applications of from ⅛ to ¼ in. on the inside brickwork of marine boilers are said to have increased the continuous operation of such units between repair layups from two months to six and eight months.

### Liquid Carburizer

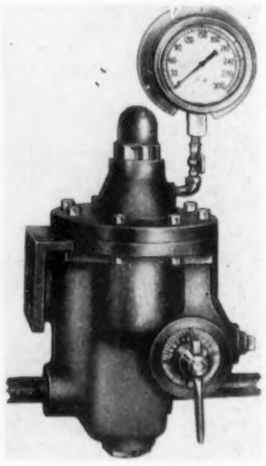
KNOWN as Karbo Kasing, a liquid carburizing process, which makes it easy to remove all traces of salt from oil quenched work, has been announced by the *Park Chemical Co.*, 8074 Military Ave., Detroit 4. The equipment regulates a small flow of oxygen into a molten bath containing Karbo Kase salt, which is a powdered cyanide base salt, completely water soluble, and in which is incorporated a carbon cover. It is said that true carbon case depths are produced on steel with this combination of oxygen and salt. Hot water washing only is required to remove the salt from oil quenched work; commercial cleaning compounds may be used if desired. Weight of the salt is 86 lb per cu ft and the daily replenishment required, which maintains the carbon cover, is be-



tween 5 pct and 10 pct of the bath weight. Little or no sludge is produced by the bath. The melting point is 1150°F, and the working range 1300° to 1750°F. The illustration shows the tube immersed in the bath, from which a constant, slow flow of oxygen is discharged, with the flow so regulated that the carbon cover is not dispersed. While the oxygen acts as the energizing agent, the mild agitation which it provides is said to contribute to uniformity of results. Equipment governing the gas dispersion consists of a two-stage pressure regulator, a rotameter for gas flow measurement, needle valve, pipings, couplings and delivery tube.

### Oil Flow Control Valve

A DIFFERENTIAL oil flow control valve, designed to obtain constant liquid fuel flow to regenerative furnaces, regardless of variations in pressure before or after the valve, has been announced by *Bloom Engineering Co.*, 857 W.



North Ave., Pittsburgh 12. Each valve is precision tested and calibrated at the factory. The position of the valve handle is a direct measurement of oil flow. Metered flow can be provided for remote indication or for application to combustion control apparatus. Valve sizes are manufactured for flows from 25 gpm to 1000 gpm and constant flow within 1 pct of the range is guaranteed. Although this oil flow control valve has been developed under actual steel mill operating conditions to solve fuel control problems of openhearth furnaces, its application has been made in other liquid fuel control problems.

### Heat Input Controller

FOR control of electric furnace temperatures, an electronic balancer input controller has been announced by the *Automatic Temperature Control Co., Inc.*, 34 E. Logan St., Philadelphia 44. This unit is designed to detect and correct the slightest deviation from any control point setting, proportioning on-time to off-time so that heat supply will automatically meet any condition of heat demand regardless of furnace and system characteristics. Once an operating temperature has been set on the control pyrometer, the input controller automatically makes corrective compensation for varying heat requirements of work loads.

# WHEN

*NORMALIZING CYCLES PULL VARIABLE LOADS ON THE ATMOSPHERE GENERATOR*

*REAL CLEAN ANNEALING OF BRASS STRIP COULD SAVE FINISHING LABOR*

*YOU WANT DRY ATMOSPHERES UNDER YOUR ANNEALING COVERS*

# THEN

## KEMP "atmos gas" can be tailored to your process

The atmosphere gas generator you use should be *tailored* both to your process and to your procedure.

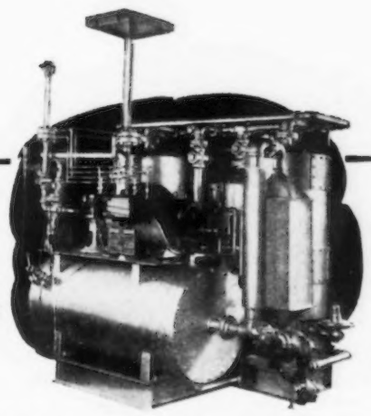
If you have a line of furnaces to be supplied by one generator (as in propeller blade normalizing) it's likely that your atmosphere requirement will be fluctuating—and you will want a generating unit which is equally efficient at 20% and 100% load—like a KEMP design.

If your process is continuous and your demand is high (as in brass strip annealing) you will want a unit which produces "atmos gas" at such low cost as 8 to 15¢ per M cu. ft. (amortization included)—which KEMP can do.

If water vapor must be removed (as in long-cycle high-temperature work) you will want a generator equipped with silica gel desiccating towers—such as KEMP engineers often build into a system.

If you want the $CO_2$ scrubbed out of the gas, or completely automatic operation, or special ignition devices, or all sulfur removed, or direct-reading flow indication—or other features which *tailor the job to your specific case*—then you're talking KEMP practices.

The coupon below will make it easy to get the full story.



**A RECENT 2,000 CFH JOB ON STEEL WIRE HARDENING**

This one (size 2MSG) has generous silica gel drying towers, orifice meters to indicate fuel and air flow, ample water-jacketed refractory-lined combustion chamber, elevated air filter, and the most precise and automatic type of carburetion obtainable. It feeds both muffle and radiant-tube furnaces in the 1400-1700°F range, by means of which steel wire (0.50 to 1.20 carbon) is heated for hardening—free from scale and decarburization—right up to the oil quench.

**KEMP OF BALTIMORE**

PRECISION CARBURETION ✦ ADAPTED COMBUSTION FOR INDUSTRY'S HEAT-USING PROCESSES
ATMOSPHERE GENERATION ✦ ADSORPTIVE DRYER SYSTEMS FOR PROCESS CONTROL AND PROTECTION

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I'll write and state my problem, so that you can talk my specific case when you reply ☐
Send your nearest field-engineer to see me ☐

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POSITION _____
COMPANY _____
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# Assembly Line . . .

WALTER G. PATTON

**• Survey shows that 381 GM parts suppliers are strikebound . . . Parts producers confused by OPA rulings . . . Unions oppose price revisions.**

DETROIT—Even before the transportation tie-up, automobile production managers were beset with operating difficulties that are without precedent in the motor industry. In a number of instances, it has become necessary to order "hand-made" parts from small machine shops in order to keep assembly lines going. Freight shipments of parts by air have saved the day on several occasions. Measures such as these, together with numerous high-cost operating practices (which must be used as long as plants continue to run at only a fraction of capacity) have held operating costs far above previous estimates. With strikes continuing—and even threatening to become worse in suppliers' plants—and the adverse effects of the railroad tie-up yet to be absorbed, it is small wonder that auto makers are looking to price rises to rescue them temporarily from their present dilemma.

The operating difficulties encountered by automobile plant managers nowadays is effectively underlined by a compilation recently made by C. E. Wilson, president of General Motors Corp. As of mid-May, GM was able to count 381 suppliers whose plants were strikebound. The list included both automobile and parts divisions of the corporation and showed that Chevrolet was hardest hit of all GM divisions, having 68 suppliers on strike at the time the list was compiled. The number of strikebound suppliers of other GM car divisions was as follows: Buick 11; Cadillac 18; GM Truck 23; Oldsmobile 12; Pontiac 11. In addition, Fisher Body reported that 18 of its suppliers were not operating.

After eliminating duplicates from the list, the survey indicated that 142 separate strikes were simultaneously in progress which affected parts deliveries to GM assembly lines. Incidentally, coal suppliers were purposely excluded from the list. At approximately the same time, the plants of 42 Ford suppliers were down.

In view of these conditions, recurring shortages of cushion springs and bumpers come as no surprise. During the past week, three GM divisions have lacked springs for car cushions. Pontiac was forced to close during the week and Buick and Olds also felt the spring shortage which is attributed to a strike in one supplier's plant and a critical shortage of high carbon wire.

MEANWHILE, GM has been using up a stock of parts previously accumulated and a critical shortage of bumpers is developing in at least one plant. If GM runs out of bumpers it will be following an established pattern. At one time or another during the past few months new Ford, Mercury, Nash and Hudson cars have been seen on Detroit streets equipped with wooden bumpers.

The replacement parts situation is equally confusing. In a letter recently sent to its members by the Automotive & Aviation Parts Manufacturers, Inc., attention was called to the fact that Order 625 under MPR 136 lets manufacturers of stationary internal combustion engines raise prices on engines and replacement parts up to 15.5 pct. No relief is given to the parts manufacturer who supplies the parts. Thus, in the case of a vehicle manufacturer who makes engines which become automotive in some cases and stationary in others, two prices are legal on the same replacement part and these prices may differ from each other by as much as 15.5 pct.

The complexity of the situation becomes more apparent when it is recalled that some parts makers sell practically their entire output as original equipment, others sell most of their output in the replacement field, while the majority sell to both markets. At the present time, ceilings have been lifted on parts used for original equipment while price ceilings are still in effect covering parts sold for replacement. As a result, the same product may be sold by the same producer both under price ceilings and free from price regulation. During the war many parts producers expanded their plant facilities in order to meet demands and a recent survey shows that sales of automotive replacement parts in 1945 were 163 pct of 1941 sales, the largest non-war year. The present capacity of the industry is estimated to be 205 pct of the largest prewar capacity.

WALTER P. REUTHER, president of the UAW (CIO) has made good his threat to file formal protest with the OPA against increased automobile prices. Reuther has asked Administrator Paul Porter to designate a board of review to hear union claims that increased auto prices are not made necessary by recent wage increases and are in violation of the President's order on wage-price policy. The union complaint further charges that present or future profits are disregarded in an OPA ruling which automatically raises prices to compensate for any increase in a manufacturer's wages or cost of materials.

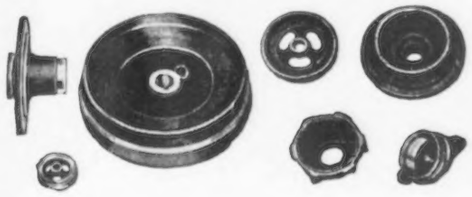
The increase of $5 per ton for

*Detroit*

**• • • Nash-Kelvinator Corp. has closed its manufacturing operations in Michigan and Wisconsin plants as a result of the rail and coal emergency. Approximately 16,000 employees will be affected. Production of automobiles and refrigerators will be resumed at the earliest possible date, according to the announcement. During the emergency shutdown Nash-Kelvinator will complete its annual inventory.**

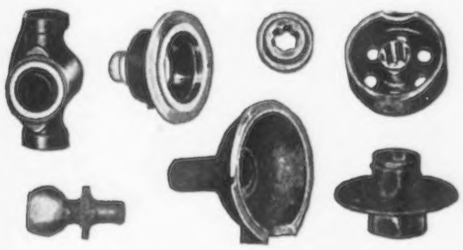
Bullard Mult-Au-Matics over a period of years have been tooled for thousands of different types of work, some of which are shown in the illustrations. Many installations previously on peacetime products were quickly converted at low cost to meet the requirements of wartime production.

Looking now towards reconversion to peacetime needs, prewar or wartime machines will require retooling, and Bullard engineers stand ready to figure your costs for maximum production and efficiency on your postwar jobs. Well-balanced operations and tooling effect a higher degree of



Mult-Au-Matic efficiency. Bullard engineers are well versed in this technique and their services are your logical choice.

Send blueprints or samples for Bullard engineering time and cost estimates on tooling reconversion. Prepare now and be ready for postwar competition. The Bullard Company, Bridgeport 2, Connecticut.



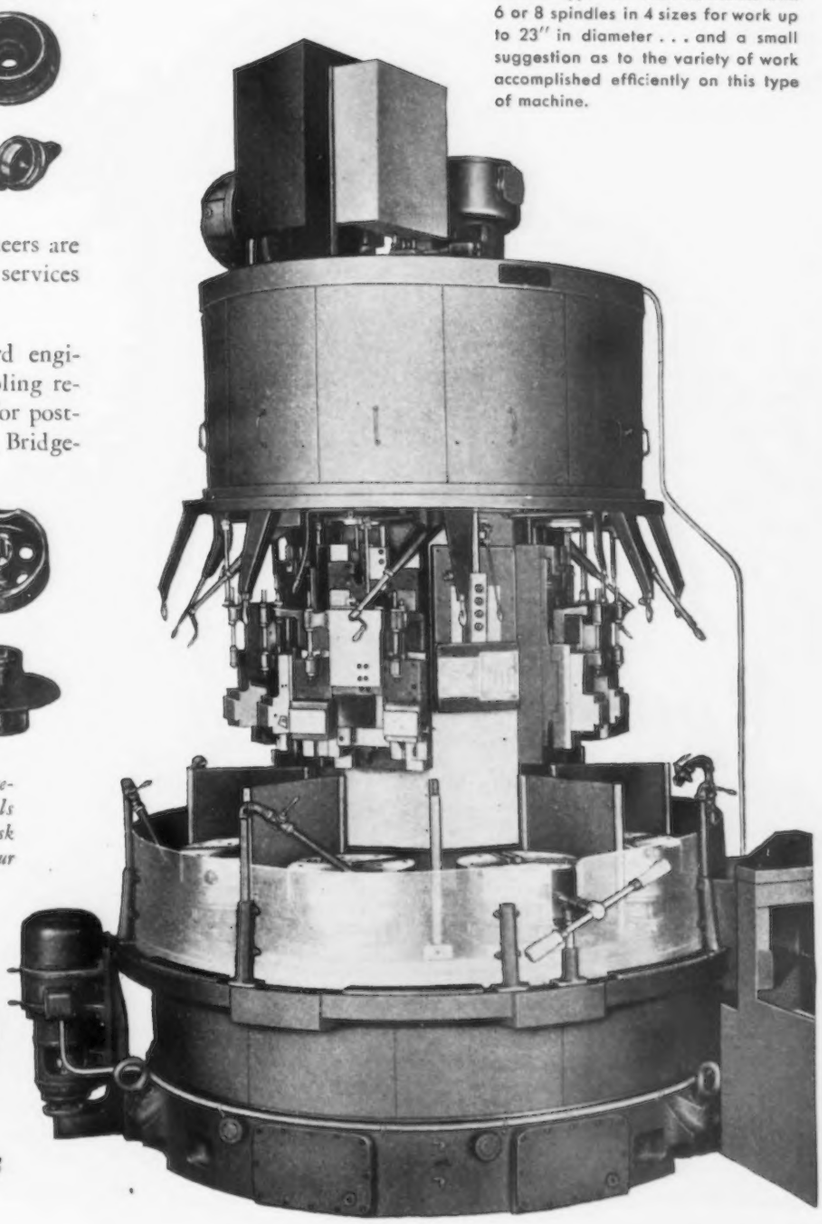
*From Government Machine Tool Surplus Lists select the better machines to replace obsolete models you've been using on non-critical operations. Ask Bullard by serial number for information on your selections.*

**BULLARD**

**CREATES *NEW METHODS***

## HOW A BULLARD MULT-AU-MATIC FITS POSTWAR PLANNING

Bullard Type "D" Mult-Au-Matics with 6 or 8 spindles in 4 sizes for work up to 23" in diameter . . . and a small suggestion as to the variety of work accomplished efficiently on this type of machine.



THE GOOD OLD DAYS: *Well here it is. Remember when "Hey, get a horse" was the general cry? There will be plenty of stories of the old days when auto men get together this week for the Golden Jubilee on May 31.*

steel granted by the government last February is one factor in the present price boosts. Additional reasons are the higher cost of most auto parts and the price increases which manufacturers are permitted to charge for "changes in design and engineering specifications" and for "improvements." These changes are authorized automatically by OPA on the ground that a better engineered and improved car is worth more money.

The end result of these increases —for wages, for parts and materials and for "improvements" has been to lift new car prices well above price ceilings originally established for the new models, thereby nullifying OPA's prediction in 1945 that the new cars would cost the public no more than in 1942. In its latest statement, OPA has definitely indicated that further increases will probably be necessary and many prospective car buyers are asking themselves when the price spiral will end, especially if the unions start another wage drive as they have already promised to do.

That the labor unions can be counted on to reach out for every possible new member is indicated by their current efforts to organize office workers, engineers and draftsmen in the tool and die shops. There are very few such employees and there is no indication that the workers themselves have any desire for union organization. It is also apparent that the interest of these employees are not parallel to those of shop employees. The only plausible interpretation, therefore, is that unions are missing no bets in their attempts to increase membership.

A small increase in automobile and truck production in the United States and Canada is reported by Ward's Reports, Inc. Estimated output for the week ended May 24 is 53,020; previous week 48,565; same week a year ago 21,010. For the corresponding week of 1941 the total was 133,560 cars and trucks.

YOO HOO, BOYS: *The famous Goldwyn Girls from Hollywood, currently appearing in "The Kid From Brooklyn," are being taken for a ride—in the No. 1 Chevrolet. This 4 cylinder touring car will be featured June 1 in the "Motor City Cavalcade" of the Automotive Jubilee celebration in Detroit.*

## Strikes Reducing GM Production Schedules

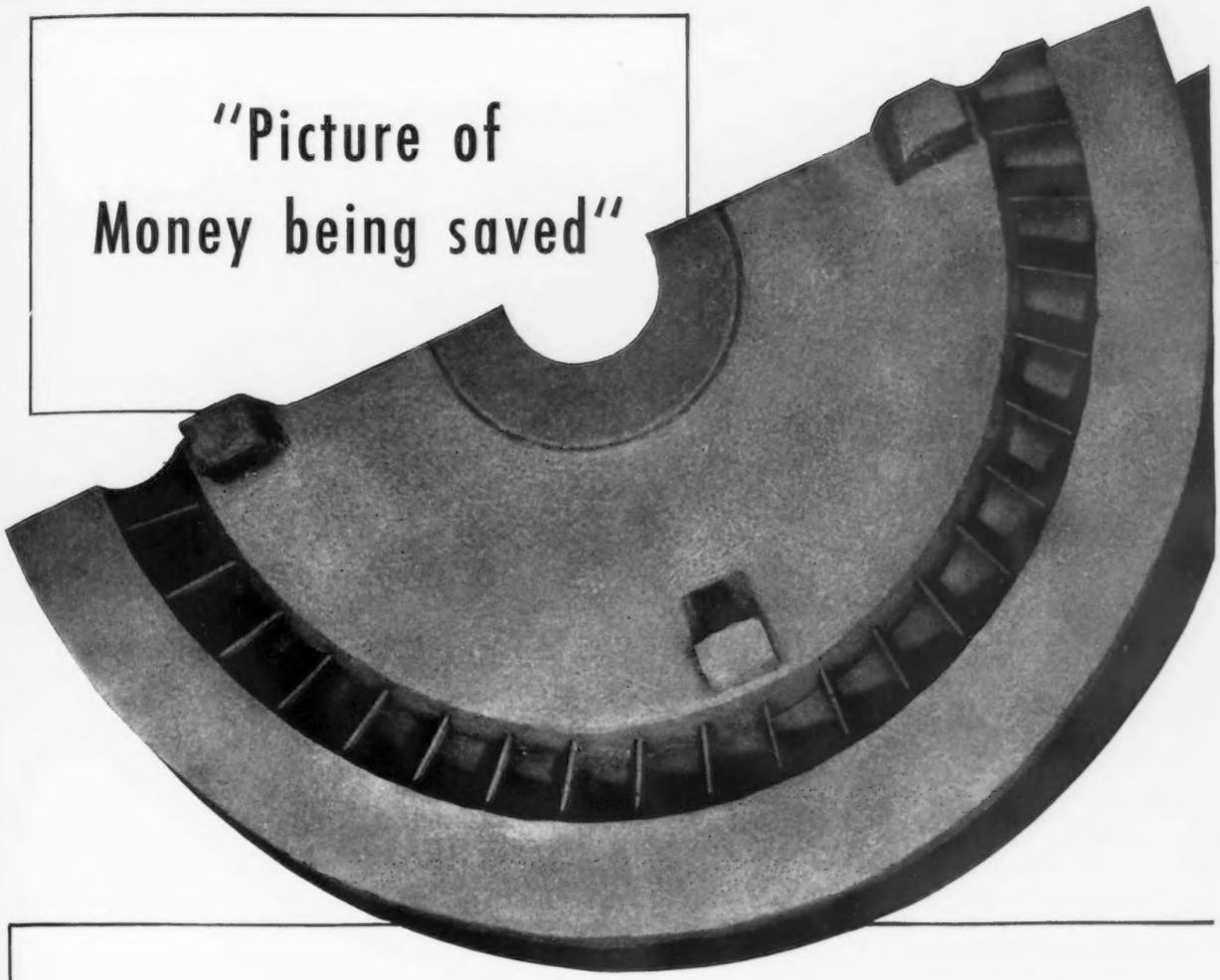
*Detroit*

• • • **General Motors** Corp. has been forced to reduce production schedules for May, June, July and August by 200,000 cars as a result of strikes in supplier's plants which have made it impossible to get the required materials, according to an announcement by C. E. Wilson, president. Production cuts will stand even if the coal strike is settled in the immediate future, according to the announcement.

Since VJ-Day General Motors has produced only 222,736 cars and trucks. It was expected that car and truck production for the period would total 1 million units and it has been estimated that strikes and shortages of materials have been directly responsible for the loss of more than 750,000 units.

GM will continue limited production currently scheduled until inventories of critical items are completely exhausted and no additional materials can be obtained. The situation brought about by the coal, railroad and other strikes differs in each plant, but in no case, it was stated, will it be possible to continue the current limited production for more than two weeks unless the coal strike is settled. Even after the national strikes are settled production will be limited until the plants of suppliers are back in operation according to the GM announcement.

# "Picture of Money being saved"



Stainless steel blades are cast right into this cast steel turbine diaphragm—blades spaced to a limit of 1/64″ tolerance on a circular pitch.

These diaphragms are used in pairs and must withstand high steam pressures and temperatures.

Formerly, these diaphragms were fabricated, with each blade set in by hand—a costly and time-consuming operation.

Here is another example of the extreme flexibility and versatility of the casting process—the modern method of making things better and at lower cost.

Why not investigate? The use of more steel castings may improve the product you make and cut your costs, too.

Consult your steel foundryman when planning new products, or redesigning old ones. He will tell you about new techniques, the outgrowth of organized research, which enable you to specify any properties of steel your work requires.

Or, if you prefer, write to Steel Founders' Society, 920 Midland Building, Cleveland 15, Ohio.

MODERNIZE AND IMPROVE YOUR PRODUCT WITH

# STEEL CASTINGS

# Washington . . . L. W. MOFFETT

**• Veterans' huge housing program set with $400 million subsidy . . . Hope to build 2,700,000 homes in 1946-47 despite material shortage.**

WASHINGTON — Pig iron and cast iron soil pipe are among scarce products which have been listed to share in a $400 million subsidy as a means of increasing supplies for building homes.

This tidy sum, which is $200 million less than had been requested, is provided in the Veterans Emergency Housing (Patman) Act and its use, according to National Housing Expediter Wilson W. Wyatt, is needed to break the bottleneck in materials to speed the emergency housing program toward its goal of getting 2,700,000 homes for veterans under construction by the end of next year when these "premium payments" will be washed out — unless extended by Congress. The incentive clearly is attractive, though it represents only one fifth of total "premium payments" now being forked out as government - by - subsidy continues to plunge forward in a shot-in-the-arm drive to stimulate output.

But this inducement does not overcome the more fundamental problem of getting a supply of labor, for which Mr. Wyatt says he is "racing;" nor does it meet the problem of getting materials necessary for the production of the subsidized items, as for instance coal, which John L. Lewis denied to the country. Even more important, the shocking housing shortage, like other shortages, might have been avoided or at least greatly relieved according to some opinion, had controls been lifted and reconversion allowed to proceed at a normal rather than a halting rate. Even assuming prices would have gone up in some lines, they would have been forced down to natural levels by higher production. As it is, OPA controlled prices are rising and a large portion of the boosts are subsidy concealed which are not shown on OPA charts.

However, sponsors of the subsidy program are placing much faith in its efficacy in meeting emergency conditions rather than being sound economically. That this is so is indicated by the three specific uses for which the payments will be made: First, to defray the extra cost involved in expanding production from currently operating plants beyond the normal optimum limits; second, to help defray costs of reopening plants closed during the war; and third, to draw in the output of certain high-cost plants which were subsidized during the war but have since ceased operation.

Mr. Wyatt has emphasized the point that the use of premium payments selectively would open up additional avenues of production which were not tapped by price adjustments alone.

SINCE passage of the Veterans Emergency Act consultants representing industries producing "critically short materials" have been called to Washington to help draft proposals for the use of premium payments. Consultants on various commodities have conferred with special task committees comprised of staff members of the National Housing Agency, CPA and OPA. The commodity task groups are subcommittees of an overall Inter-Agency Organization, embracing representatives of the three agencies and the Office of Economic Stabilization and RFC, which was set up to coordinate general policies relating to the veterans emergency housing program. Proposals arrived at by the task committees after conferring with the consultants are to be submitted for consideration to joint advisory committees comprised of industry executives already serving in similar capacities to CPA and OPA.

The Act also authorizes the Housing Expediter to guarantee markets for prefabricated houses and new building materials. Mr. Wyatt said that this device would be used to step up production by manufacturers who under normal conditions "would follow a slow and cautious course of expansion." Estimates have been made that between 800,000 and 850,000 such houses will be built in 1946 and 1947. Markets for prefabricated houses will be guaranteed, he said, primarily for units incorporating unusual methods of construction or using materials such as plastics, concrete and aluminum, not ordinarily used in housing. It is hoped that this guarantee will bring a sharp increase of prefabricated houses through drawing into the field producers ordinarily engaged in other lines, such as shipbuilding and airplane manufacturing. A market for 200,000 prefabricated houses at one time can be guaranteed by the Housing Expediter. If a producer cannot find a market for houses that are guaranteed he can have the government take them over at 90 pct of his market price.

Under the Act, signed by President Truman on May 22, the Housing Expediter is authorized to fix ceiling prices on houses completed after enactment of the law. Sales prices on these houses can be set in any area when prices increase or threaten to rise. Ceilings would take into account reasonable construction costs, the fair market value of the land with allowance of a profit comparable to the 1941 margin.

The Housing Administrator, among his broad powers, can allocate and give priorities on materials, bar the export of building materials for housing and give orders to OPA and other agencies with respect to pricing.

* * *

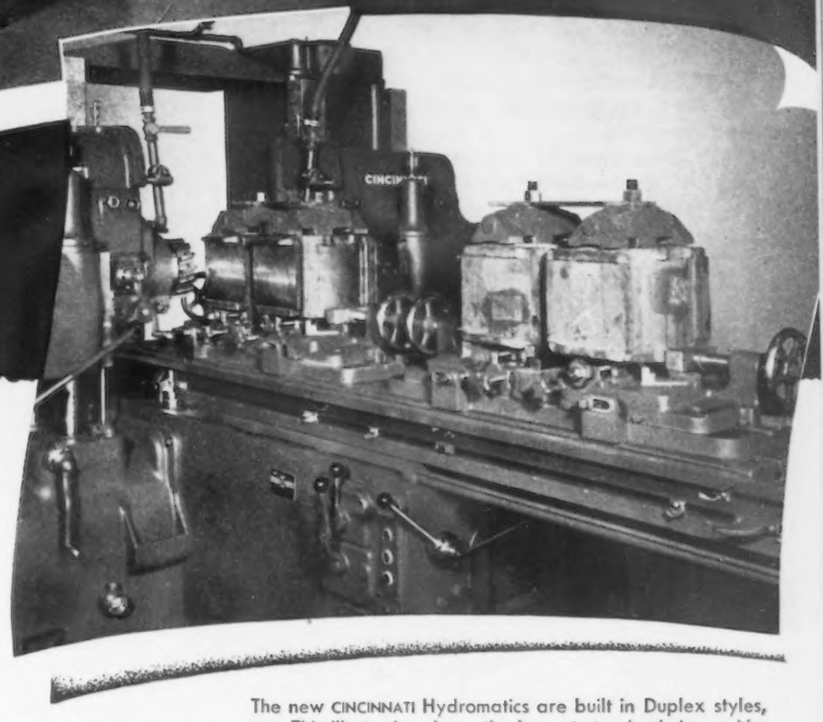
THE Price Review Board, WAA, has authorized the expenditure of up to $115,000 to clear and put in efficient operating condition the Trentwood, Ore., aluminum rolling mill recently leased to Kaiser-Frazer Corp. with that understanding.

# *Introducing*

# THE NEW

# CINCINNATI HYDROMATIC MILLING MACHINES

The new CINCINNATI Plain Hydromatic Milling Machine (No. 5-60 size illustrated). Catalog M-1372 contains complete specifications and details of features for both the Plain and Duplex styles.



The new CINCINNATI Hydromatics are built in Duplex styles, too. This illustration shows the largest standard size, a No. 56-90, tooled up to mill the channels in cast steel journal boxes. Here is concrete evidence of the ruggedness and cutting capacity of these new machines: Both spindles are taking a cut ⅜" deep by 11" wide (the full diameter of the cutters).

● You can expect big things from the new CINCINNATI Hydromatics. They're heavier, and much more powerful. They incorporate all the time-proved Hydromatic features, plus many new and exclusive advantages which make them especially useful for heavy cuts and rapid metal removal on all types of metal, and using all types of cutters including sintered carbide. The new CINCINNATI Hydromatics are built in twelve sizes, in Plain and Duplex styles, ranging from 24" to 90" table travels, powered by 7½ to 30 h. p. motors (higher if desired), depending upon the size of the machine. Catalog No. M-1372 contains complete specifications and other important details. A copy of this informative book is yours for the asking.

CINCINNATI

## THE CINCINNATI MILLING MACHINE CO

**CINCINNATI 9, OHIO, U. S. A.**

MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES

The contractor will be employed by WAA, but the actual work will be under combined supervision of the lessee and Defense Plants engineers.

* * *

**Loofa sponges** have been exempted from price control by OPA following WAA announcements that it has 5 million on hand and will place 1 million immediately on the market. Navy used them for filter elements in marine engines . . . Manufacturers of small (1000-a-day capacity) concrete blockmaking machines now have more than a 6-months backlog of orders which carry a CC priority rating.

* * *

**With the nation** figuratively hay-wire, literally speaking the shortage of hay-wire is causing acute distress among agriculturists as the hay-baling season approaches with supply falling far below needs . . . A pass-through increase of 18 pct over October 1941 prices has been granted by OPA to manufacturers of industrial air compressors, their integral parts, and accessories.

**Less than $3 billion** of $19 billion worth of radio, radar and electrical war equipment is suitable for resale for civilian use. One reason is that some is special purpose equipment; another that much of it went into war plant construction . . . Despite two price increases, the present average ceiling of $65 a ton for wire nails is $15 below the average of 1920.

•

## Removes Special Ceilings

*Washington*

• • • **Effective May 27,** special ceiling prices for special price class purchasers of machines, parts and industrial equipment have been abolished, OPA has announced. These prices were formerly frozen at base date levels lower than to all other buyers of the same products.

This action covers all products included in RMPR 136 but actually affects only the purchaser in a price class by himself such as a buyer of large quantities who had been given special low prices during the base period.

Because of the lower ceiling, many such buyers were unable to buy direct from the manufacturer but were forced to buy from other purchasers, thereby having to pay more than other buyers in their class.

THE BULL OF THE WOODS — BY J. R. WILLIAMS


THE NOSE AND THE GRIND

## Extends Pricing System

*Washington*

• • • **OPA has announced** that the pricing system provided for specified sales by manufacturers of tools, dies, jigs, fixtures, molds and patterns on Apr. 26 has been extended for use by them when these items are made and used specifically with any product and sold to the buyer of that product.

When adopted last month, this pricing system was designed to allow these manufacturers maximum prices that at least equal current total costs but only when the items were made and used specifically in connection with the manufacture of a product covered by the general machinery regulation.

The extension, effective May 24, was authorized when it was found that the need for the current total cost provision was not restricted to the sales to which it was first limited. The action is designed to remove any price barrier to production of these essential products by not only permitting manufacturers to continue their base period practices, but also assuring them, in all cases, of recovery of total costs, OPA said.

•

## Reduces Profit Factor

*Washington*

• • • **OPA has reduced** from 5.4 pct to 2.9 pct the profit factor for manufacturers of metal office furniture to use in calculating individual firm reconversion adjustments. Effective May 27, the factor is used by reconverting manufacturers unable to operate under the industry-wide 10.5 pct increase over 1941 prices authorized in April. Such manufacturers calculate their own current costs of production as defined in the reconversion order and add the profit factor to arrive at their new ceiling prices.

The earlier factor was calculated by OPA on the basis of 1936-39 profit figures for an industry group of which metal office furniture was only a segment. Since then separate figures have been collected for this industry and show, OPA said, that the new factor is more properly applicable.

Profit factors as issued by OPA amount to half the margin over cost realized during 1936-39 by an industry or industry group.

# In Product and Method Research consider this *Versatile* Metal

**When seeking the "ideal" metal to improve your products or methods, consider Carboloy Cemented Carbide.**

**Accepted as an excellent cutting material; indispensable in many types of dies, this versatile metal also has many *other* possibilities because it combines in the *one* metal *all* of these useful properties.**

## 6 Unusual Qualities Combined in ONE Metal!

- High Red Hardness
- Extreme Density
- High Abrasion Resistance
- High Modulus of Elasticity
- High Compressive Strength
- Low Coefficient of Expansion and Contraction

### 26,000,000 FLASHLIGHT BATTERIES FROM *ONE* EXTRUSION DIE!

Extruding abrasive carbon rod is rough on dies! One manufacturer's Carboloy Dies produced 5,000,000 feet of rod, compared to steel's 75,000—that's 67 to 1 greater die life! Longer held die tolerances also gave cells more uniform electrical qualities.

### TURNING WATCH PARTS WITHOUT ANNEALING

This solid Carboloy* watchmaker's graver cuts hardened watch parts. Ordinarily, with diamond cutters or sapphire strippers, burnish or temper must first be removed.

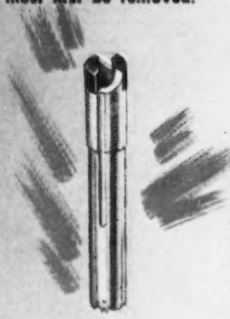
### "OUNCE-SIZE" TEETH THAT TAKE 2-TON "BITES"

Carboloy Cemented Carbide "teeth" on these tongs insure safe lift-and-carry of 2½-ton steel billets; bite into tough metal with a bulldog grip; last for days, compared to hours for steel "teeth".

### CUTTING CONTAINER COSTS

In making scored-top food cans with hinged lids, the rolls for scoring and hinging ordinarily require costly maintenance at frequent intervals. One plant solved the problem with Carboloy* rolls lasting 35 to 1 over steel!

### DRILLING CASE HARDENED STEEL FOR TEST BARS



This Carboloy* tipped core drill trepans thick, case hardened steel, obtaining test bars for hardness measurement at any depth. Formerly, case depth could only be assumed by resistance to drilling from "soft" side.

### TO SPEED YOUR IDEAS INTO METAL

Carboloy Cemented Carbides can be supplied in virtually any shape or size, for use wherever there's wear on product parts, or on tools and dies for cutting and forming.

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**CARBOLOY COMPANY, INC.** 11153 E. 8 Mile Blvd., Detroit 32, Mich.

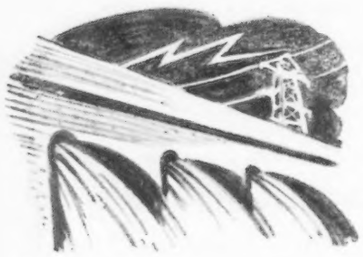
* CARBOLOY (TRADEMARK) CEMENTED CARBIDE

HARD METAL

# West Coast . . .

ROBERT T. REINHARDT

**• Another steel plant projected for the Los Angeles district . . . Acceptance of corporation's bid for Geneva enthusiastically endorsed by westerners . . . Steel shortage continues to stint established fabricators and stifles new ones.**



LOS ANGELES — The men and women who pioneered this western country have their modern counterparts in the company of O'Keefe & Merritt which has adopted the pioneers' philosophy, "If you can't buy it, make it yourself!" Finding that the acute shortage of steel sheets was threatening its thriving stove and refrigerator manufacturing business, the company has announced plans for the construction of an openhearth furnace and sheet mill with a capacity of 50,000 tons per yr.

O'Keefe & Merritt Co. is one of the largest manufacturers of kitchen ranges and electric refrigerators on the Pacific Coast and as such has been hard hit by the withdrawal from the western market of eastern sheet suppliers. As the plans now being worked out with Loftus Engineering are set up, a large part of the plant's capacity will be utilized by the mill operators, but it is believed that a surplus of hot-rolled sheets will be made available to other users.

Recalling the skepticism which developed when plans of Henry J. Kaiser for a steel plant in this area were first announced, this proposal is being watched with great interest. As it is anticipated that full production of this new unit will be reached in the first quarter of next year, about the time that Bethlehem's Sparrows Point plant and Columbia's new plant at Pittsburg, Calif. get into full swing, some skeptics are wondering if the move is well advised. Well informed industrialists fully expect that increased production of steel sheets by Bethlehem and Columbia early next year will solve the sheet problem on the Coast. However, these same men are willing to admit that if low cost production can be achieved on a heavy scrap charge and if suitable small mills can be obtained at reasonable cost, O'Keefe & Merritt Co. might find itself in an advantageous competitive position.

The site for the openhearth and rolling mills has not as yet been announced, but it is understood that it will be located in the heart of this city's industrial section.

Start of the $25 million expansion program of Columbia Steel Co. is expected immediately with the announcement that J. H. Pomeroy & Co. and Bechtel Bros.-McCone Co. of San Francisco, have been awarded a $6 million contract for all construction work in connection with the erection of the new sheet and tinplate plant at Pittsburg, Calif. Award for constructing the superstructure for the new plant has been made to the American Bridge Co. of Pittsburgh.

Word that the War Assets Administration had accepted the bid of U. S. Steel Corp. for the Geneva plant was received enthusiastically although there was some question as to whether acceptance was based on the recommended condition of the steel committee of the Western States Council that the corporation pledge itself to price its products as low as production costs at Geneva would allow instead of using the existing basing point prices.

K. T. Norris, chairman of the steel committee of the Western States Council, and president of Norris Stamping & Mfg. Co., made this statement to THE IRON AGE:

"As chairman of the steel committee of the Western States Council, I am most pleased with the report that the War Assets Administration has recommended acceptance of the bid of the U. S. Steel Corp. for the Geneva plant. The committee had definitely recommended acceptance of this bid after a thorough study of all the bids submitted.

"However, the committee did recommend to Lt. Gen. Edmund Gregory, a modification in the statement of the present policy included in the bid of U. S. Steel Corp. I do not know if this recommendation has been adopted, but the committee, in asking the Attorney General to approve the recommendations of the WAA, has insisted on this modification.

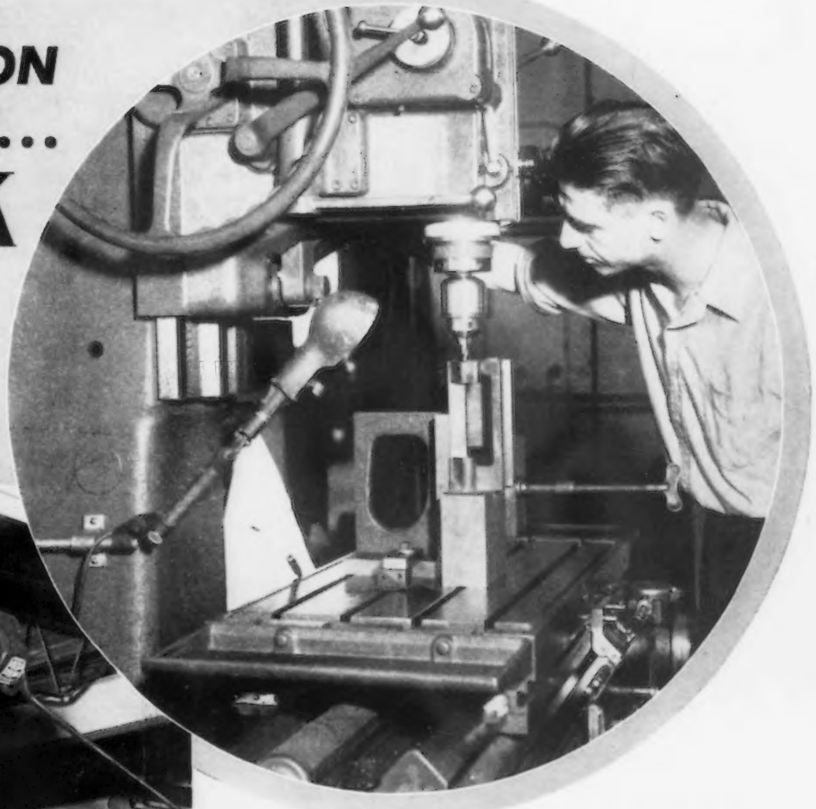
"The actual transfer of the Geneva plant to private ownership will permit this important project to get out of the 'talking' stage and into the 'action' stage. Considering the critical situation with respect to the supply of steel on the Pacific Coast, we are fortunate in having the plant go to the company which has operated it during wartime as this should result in production at the earliest possible moment.

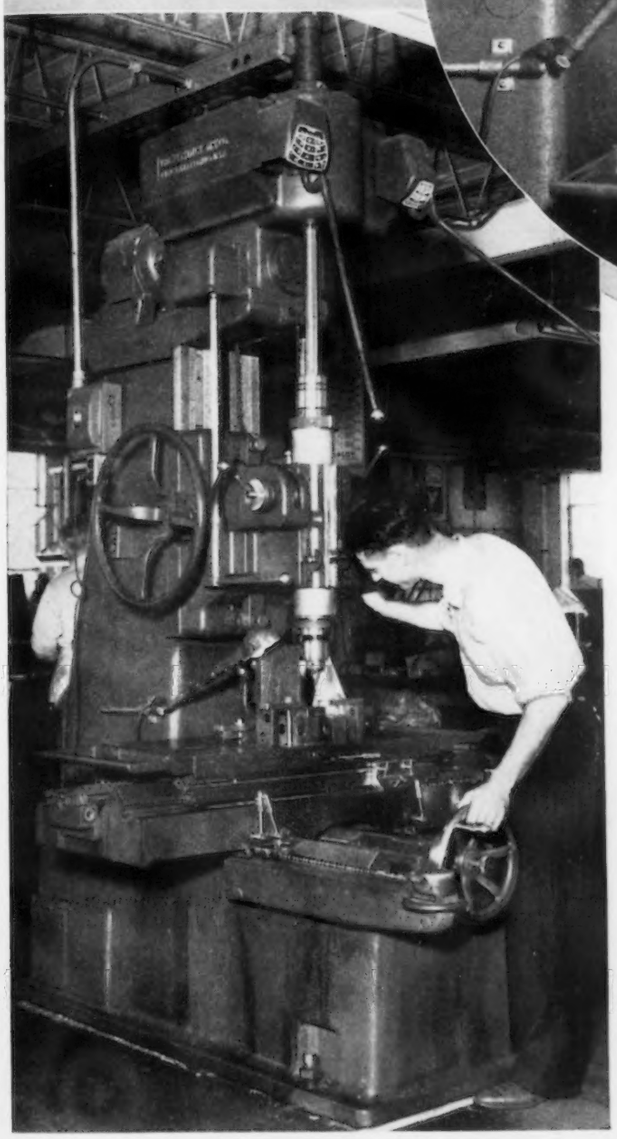
"From my discussions with officials of the U. S. Steel Corp., I am confident that the corporation intends to immediately embark on a progressive program, having as one of its primary objects expansion of the market for steel in the western states and that such a program will accelerate the tremendous industrial development which has been underway in this area for the past several years."

SINCE word was first received that WAA favored the corporation's bid, telegrams from the local Chamber of Commerce and many businessmen here and in Utah have been showered upon Attorney General Tom Clark urging him to approve the bid. Information that the Price Review Board had given its approval was taken to mean that efforts of Wendell Berge to bar the award would be ineffective.

Apparently the efforts of Colorado Fuel & Iron Corp. to mobilize public support for its bid came too late to be effective. In press conferences conducted in Colorado

# FOR *PRECISION* AT LOW COST... FOSDICK JIG BORER





● One of the most useful and economical machines for Tool & Die Shops and for Tool Room work is the Fosdick Jig Borer.

Its versatility in handling a wide variety of work—its simplicity of control and operation—its moderate initial cost—and its dependable precision make it most desirable for the production of small lots and for accurate die and tool work.

Illustrated are two typical Fosdick Jig Borer set-ups for drilling operations in the plant of the Stellar Tool & Gauge Co.

Its rigid sturdy construction and conveniently located controls enable the average shop man to operate the machine accurately without long experience and produce precision work at low cost.

*For detailed description of machine and examples of typical jobs write for Jig Borer Bulletin J. B. I.*

**FOSDICK MACHINE TOOL COMPANY**
CINCINNATI 23, ··· OHIO

and Utah, representatives invited questions on their intentions and plans and only in rare instances took refuge in "off the record" replies. These officials were armed with documentary evidence of a large amount of preparatory work in connection with their bid and offered a breakdown of what they proposed to produce at the plant when it settles down to what might be called a normal and continuing market. Fifteen years was the estimate given by C F & I representatives as the period needed to get the plant into its "economic maturity." The hoped-for tonnage production at that stage was given as: Plates, 106,000; structurals, 54,000; heavy rails, 133,000; tie plates, 17,000; angle bars, 17,000; car wheels, 35,000; car axles, 26,000; hot and cold-rolled sheets and strip, 226,000; tinplate, 186,000; total, 800,000 tons.

C F & I estimated that the $48 million specified in its bid as a government investment would provide the facilities for this production.

While the battle of giants (and some smaller fry) goes on for operation of the Geneva plant, established metal fabricators, distributors and would-be fabricators stand on the sidelines and hope that whoever gets it will send a few sheets to the West—and soon.

One of the latter is James C. Scurlock who has been director of engineering laboratories at Ryan Aircraft in San Diego and who is now attempting to get enough light gage steel sheets to manufacture a few structural panels of his own design, which he claims has great possibilities as walls for homes, offices, schools and other buildings and for variety of uses in trucks, trailers, ships, aircraft and any place where strength and light weight combined with stability are required.

Trudging from one sheet supplier to another, Mr. Scurlock has met the same response, "We must supply our old customers first so far as we can."

The sample of the panel Mr. Scurlock is showing to prospective sheet suppliers has evoked considerable interest as the possible outlet for large tonnages of light gage material. Sheets in gages of from 26 to 16 have been embossed with a pattern of truncated pyramids and then welded face to face by resistance. It is Mr. Scurlock's plan to include resistance wire between the two segments of steel and thus afford radiant heating for walls or ceilings of homes and offices. The inventor contends that with this type of panel on wall or ceiling, radiant heat becomes economical and practical. Present plans call for the production of approximately 100 Btu per hr per sq ft of panel, although the amount of heat is readily variable.

Unable to secure enough material for large-scale tests, Mr. Scurlock has nevertheless produced a sufficient amount of the panel to determine that he can mass produce the panel at a rate well above 1500 sq ft an hr on a simple mechanical press and he believes the material can be sold for approximately 20¢ per sq ft at the plant.

The present panel presents a waffle-like appearance on both sides with the truncated pyramids having a surface area approximately ½ in. sq and ⅓ in. deep.

The inventor has been working on the design and production of the material for the past 3 yr and has already supplied aircraft and trailer manufacturers with commercial quantities of similar panels. Potential orders for the present panel are dependent upon a supply of sheets.

IN SPITE of the serious shortage of steel in the area, industries are pushing expansions as rapidly as possible. Earle M. Jorgensen, distributors in Houston and Oakland, Calif., as well as here, is increasing its warehouse space by the addition of a 60 ft by 230 ft bay at its Los Angeles plant and expects to use it primarily for stocking sheets. equipment will include a five-ton crane and ¼ in. shear. The local warehouse already has 132,000 sq ft. A new office is also under construction which will be approximately twice as large as that at present. Total cost of expansion now underway will run approximately $250,000.

Soule Steel Co. is also adding to its warehouse space by erecting a structure which will more than double present capacity. According to local management if the materials were available its production of doors, sashes and structural fabrication could be almost doubled.

Kilsby & Harmon, Inc., pipe processors, is also increasing the size of its operations. Under the direction of F. G. Harmon, vice-president, this company is increasing the size of its plant to approximately 38,000 sq ft. Mr. Harmon, who is credited with building the Pacific Tube Co. and putting it in production in 67 days during the war, founded Kilsby & Harmon with R. P. Kilsby, representative of B. & W. Pipe, last year. Believed to be the only operation of its kind in the West, this company hones, bores and in other ways processes carbon, alloy and stainless steel pipe for a variety of uses. A special machine which will hone the inside of a tube 30 ft long to close tolerances has been developed at the plant. Such pipe is widely used as cylinders for hydraulic equipment. Large stocks of the usually hard-to-find pipe is kept on hand for quick delivery to oil refineries, food processors and chemical industries.

PORTLAND — L. C. Anderson, secretary-manager of the Portland Iron Works, is the newly elected president of the United Metal Trades Assn. of Oregon. He succeeds Robert L. McCulloch, McCulloch & Sons, president for the past 2 yr.

Other new officers include Edward G. Huffschmidt, Western Foundry Co. and Industrial Iron Works, vice-president; John L. Stevenson, Steel Tank & Pipe Co. division of the American Pipe & Construction Co., treasurer; and the following trustees: H. G. Boutin, Vaughan Motor Co., William C. Oetinger, Lingbeil & Oetinger Machine Works; Walter O. Paulson Jr., Paulson Machine Works; A. R. Prier, Oregon Brass Works; William R. Pindell, Northwest Foundry & Furnace Co.; and Robert L. McCulloch, retiring president.

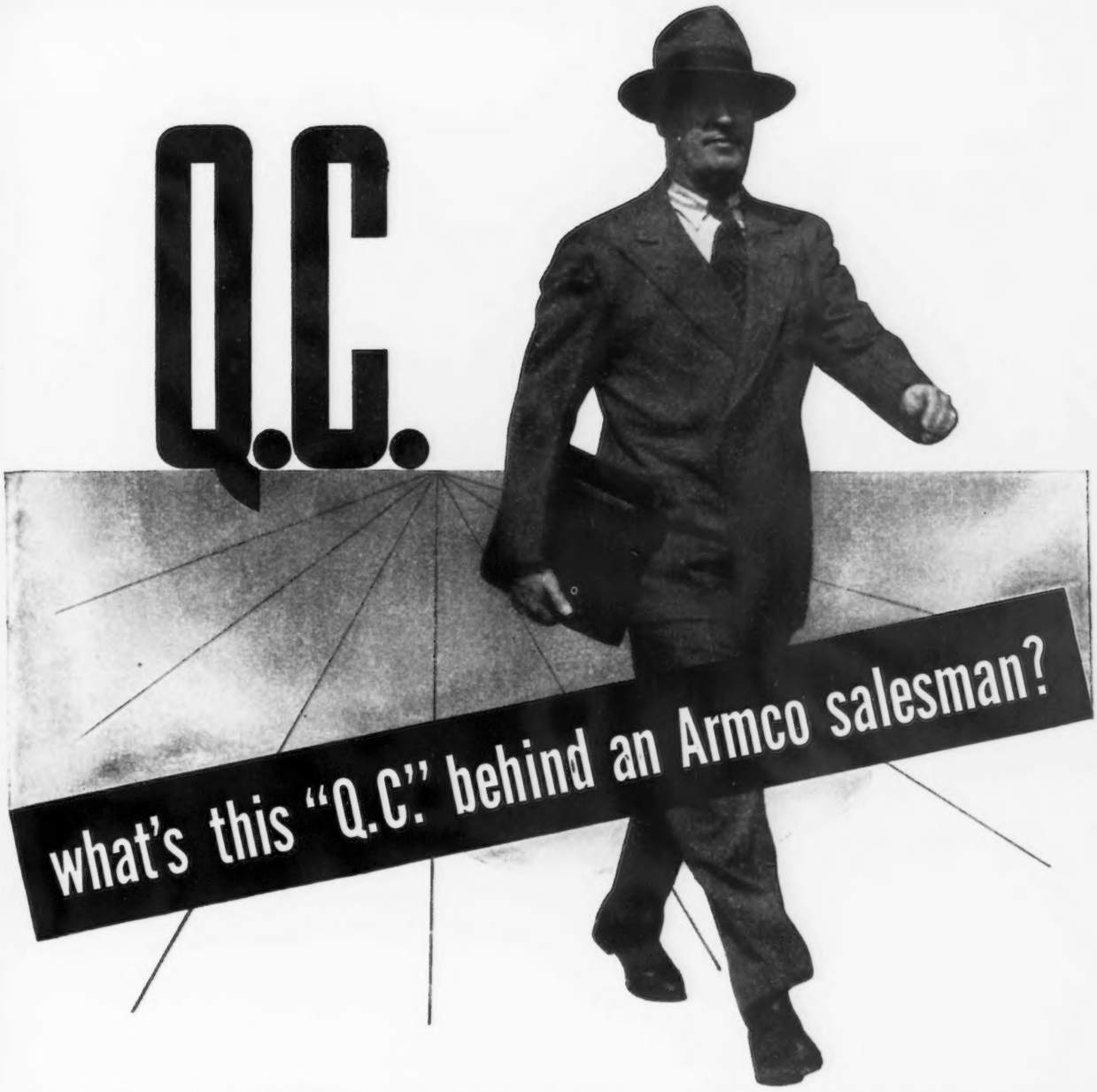
The association includes operators of foundries, machine and pattern shops and steel fabricating plants, in the Portland area.

## Reclamation Awards

*Washington*

• • • **The Bureau of Reclamation** has authorized letting a $167,815 contract to the American Bridge Co., for the manufacture of three penstock coaster gates and a $81,984 contract to the Pacific Engineering Co., Alameda, Cal., for the Shasta Dam on the Central Valley project in California.

# Q.C.



## what's this "Q.C." behind an Armco salesman?

When the Armco salesman sends your order for special-purpose sheet steels to the Armco mills, he sets in motion a chain of "Quality Controls."

For more than 20 years supervisors at Armco have referred to these special prescriptions as "Q. C."

Summed up quickly, this is what Armco "Q. C." means to you: You get the *one right steel* for the products and equipment you make.

**STARTS WITH SALESMAN**

The salesman indicates the kind of steel you want—for what purpose it will be used and how it will be fabricated. Frequently he will ask for blueprints and other information about your application.

This is the reason: Back of him metallurgical and operating supervisors are ready with the "follow-through" to help insure Quality Control for the special-purpose sheets you buy. They weigh and sift requirements—determine the correct temper, annealing and the sequence of operations that will give your sheet steels the properties they need. Previous orders and similar applications are studied too.

All these data go on a routing card. From open-hearth to shipping department, this individual card accompanies your order. It is your assurance of a high "Q. C." in the Armco special-purpose steels that go into the products bearing your name. The American Rolling Mill Company, 3081 Curtis Street, Middletown, Ohio.

*Export: The Armco International Corporation*

SPECIAL PURPOSE ★ ARMCO ★ SHEET STEELS

**THE AMERICAN ROLLING MILL COMPANY**

# European Letter . . . JACK R. HIGHT

**• British subjects heave sigh at loan prospects . . . Steel plan criticized as favoring status quo . . . More ruthlessness in scrapping obsolescent mills urged.**

LONDON — British citizenry heaved a collective sigh of relief after the passage of the loan bill by the Senate, and took another notch in its belt to last until the House takes action. There can be no full realization of the gap in feeling between American public opinion and British in such matters by people who have not visited both places.

While America is weighing economics and politics and foreign policy in the debate on the loan, Britain long ago made up her mind on the subject. True, she participated officially in the discussions of the terms, but the man in the street had his mind made up before the discussions started.

There could be no compromise with sentiment; anything less from America than an outright gift was certain to be unacceptable to the British palate and to British pride. One of the first questions put to me when I arrived in London last October was if such an outright gift were probable.

The announcement of an interest bearing loan was a bitter pill for people on this side of the Atlantic, and one that will be long remembered. But the hardest blow of all has been the protracted period of discussion. To an American it has been the normal period of judicious consideration that every measure receives in our legislative mill. But to the Englishmen it has meant the continued absence of many of the amenities of life, which he willingly gave up during the war, but is now beginning to want desperately.

Ill-advisedly, in consideration of past performances, British correspondents in Washington left the impression with the British public that after the terms were announced, Congressional approval and the cash would be almost immediately forthcoming. The sting of accepting a loan was thus diminished by the prospect of ending cigarette queues, gas rationing, some food shortages and a number of other petty annoyances.

The London press featured headlines in January listing American imports to be purchased with the loan that could be expected "before the winter is over." Women cheered at promises of more lipsticks and other cosmetics. Men dreamed of motor trips in the spring (the ration is 5 gal per month). Industrialists saw visions of new specialized equipment obtainable from American producers. Dorman Long saw a new wide flange beam mill practically in flight across the Atlantic.

The state of suspended animation that has characterized all these dreams since their origin is getting slightly boring to most Britishers.

The dark days of the Senate filibuster on the loan saw much of the public here trying to adjust itself to the idea of doing without what it had been counting on for months. The English people would have accepted the defeat of the loan quietly, but I am sure that they would never be able to understand such an action. I was particularly interested however, to see the detached tone which the *Western Mail*, South Wales daily, took at the dimmest moment in discussing such an eventuality.

The *Mail* advised its readers editorially that although time might prove an unwilling Congress wrong in the matter of the loan, it was a matter for Americans to discover, and should not be allowed to mar the relations between two great countries.

There is no more interesting subject than this great gulf between American and British thinking, and no less a personage than the late Lord Keynes noted this gap on his return to defend the loan before the House of Lords last winter. The British mind is wholly convinced on the principle of equal sacrifice in the problems that grow out of the war, as well as it was during the war.

Equal sacrifice means, to an Englishman, scarcities and rationing. It means hardships that America did not know during the war. And just as most Americans are oblivious of these facts that dominate British thinking, Englishmen have no grasp of American views. Certainly few English citizens realize the much better job they have done of paying for the war as they went, even though it meant austerity.

* * *

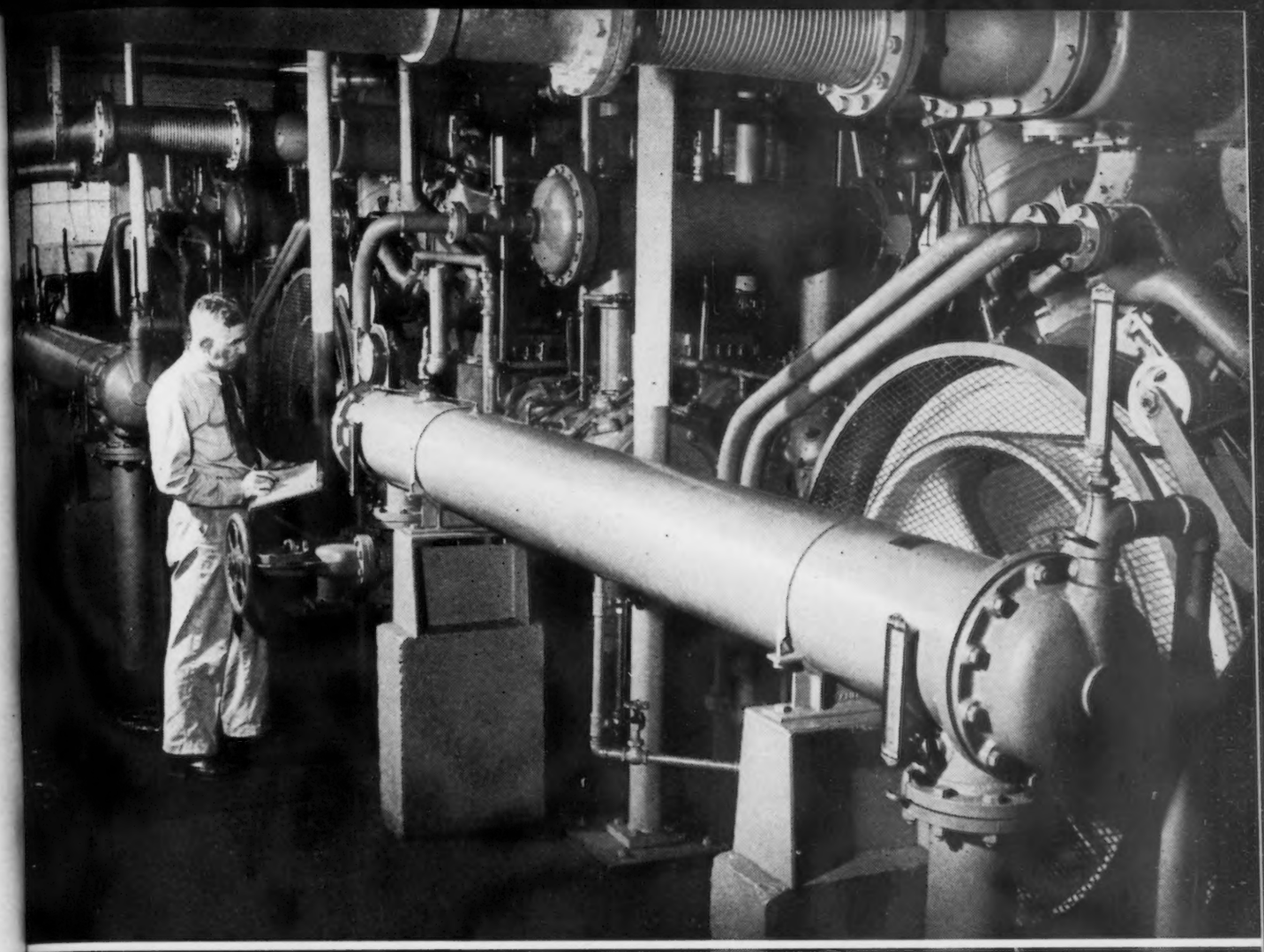
A ONE-HUNDRED page white paper on the modernization of the steel industry, took a fair amount of digestion, and editorial comment here on the merits of the plan as presented by the British Iron & Steel Federation have developed more slowly than usual. The general reception has been good, as could be expected, as most of the daily press is supporting the industry against the encroachment of the nationalizing government. As a result, the bulk of the comment has tended to use the plan as a convenient post over which to whip the government.

Thus, space which might have been used for a discussion of the merits of the plan as developed has in fact been more frequently used to rehash old familiar political arguments as they relate to the steel business.

In contrast, the *London Economist* brings forth, with customary candor, its critique. The main points are the limited provision for the development of steel export, and the general "concessions to the status quo." According to the *Economist*, the plan favors existing locations and sites for not easily demonstrable reasons. The expansion of Scottish output is used as an example.

* * *

FIRST liberal admissions of Americans and British into the Russian zone of Germany were made to the Leipzig fair recently. The extensive displays of manufactured goods serve to point up what is developing into a minor thorn in



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**Lubricated** with Sun compressor-oil, these units have had no lubrication problem. There has been no time-out for shutdowns, overhauls, or repairs due to failure of lubrication.

**Records** like this are being made every year in hundreds of plants by Sun products, refined to meet special industrial uses.

**In your Diesels,** turbines, gas engines, or other prime movers . . . in your machine-tools . . . hydraulic equipment . . . gears . . . bearings . . . special Sun lubricants protect your machinery, keep wheels turning smoothly, economically. Call in the Sun man in your territory today for high production, low costs.

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the side of occupying Western powers. The goods on display were largely prototypes of products that could be produced in Germany, "if," and the ifs are many and great.

But there is some evidence that the Russians have been playing reparation demands from the western half of Germany under the terms of the Potsdam Agreement, against its own policy in the eastern half of Germany. It seems likely that a large ball bearing plant removed from southern Germany and given to Russia for reparations is now operating in the Russian zone of Germany.

Then in the continual political byplay that the occupying powers are deliberately fostering in Germany, there is reference to the Russians crossing off thousands of plants from their lists demanded for reparations. Such activities are good examples of the kind of activity that an underground pro-Nazi rumor factory could easily spread. On the other hand they reflect what is an established fact: The Russians are as active politically in their half of Germany as they are economically. Admittedly, as far as the American control authorities are concerned, they are but amateur politicians. In contrast to a Red Army with its political representatives present everywhere, the American control officials often behave in political matters as novices.

If, then, the Russians have chosen to interpret the Potsdam Declaration as giving them permission to do what they want with reparations, including leaving them in Germany, and can so easily make political hay with the fact in their own zone, there is little to stop them.

A tour now in progress of technicians from all countries covering all zones should clearly establish the facts on this subject, but a public report of their survey is doubtful.

## *British Set Drive for Steel House*

***London***

• • • **The steel house** being built by the British Iron & Steel Federation is the subject of an intensive drive by the Ministry of Health for this year's production. A special memo has been sent out from London to all the principal urban housing councils, and orders are expected to total 15,000 from the immediate replies.

Paradox of the scramble of orders is that the house which is to be built does not actually exist as yet. The Iron & Steel Federation put up an experimental unit at the government's housing site outside London in 1944 but the design is known to have undergone a number of modifications since that time.

In the ensuing period the Federation has formed a company for their production known as British Steel Houses, Ltd., and has lined up a number of large contracting firms to participate in the prefabrication. The house is considered a permanent type, and retains the general layout of the experimental house, with three rooms and hall downstairs, and three bedrooms and bath upstairs.

The Ministry of Health is not approaching the steel house, nor any other prefabricated type for that matter, as the solution to the housing problem. It is considered rather as a possible means of increasing the number of houses that can be completed in the next 12 months without impairing the regular construction of brick houses that are considered the only "conventional" house by an Englishman.

According to an estimate by the Federation, the contractors should be able to furnish 30,000 of the units within the next 12 months, if the orders warrant. Deliveries are promised for May or June. The memo which went out last month was a call for local councils to rush their needs to the ministry so that an actual order might be placed with British Steel Houses. According to a ministry spokesman there has been no official order for the house as yet.

In an effort to guarantee in so far as possible the delivery of houses on schedule the individual contractors participating in the plan will undertake to produce the houses as individuals, but have entered into mutual assistance pacts to come to each other's aid if need be to meet delivery dates.

The ministry is making the arrangements for the production of the houses on a national basis, as well as the terms upon which they are made available to the local housing authority. British Steel Houses, Ltd., nominates the contractor, and the local authority places the contract with him. The central firm also arranges for factory inspection at the plant of each firm furnishing steel components for the houses, and will obtain guarantees that the material is according to specification.

The house is considered particularly appropriate for urban use, and is basically planned for what the British know as semidetached, or double construction. A plan is also understood to be in preparation for construction in terraces of four. Costs at present are said by the ministry to be "substantially higher than the comparative cost of traditional houses." The ministry intends to get a subsidy to make it possible for local authorities to obtain the houses at prevailing prices for brick construction.

The prices at which the houses will be provided in accordance with the standard plan will be as follows:

50 houses on one site—£1307—($5228)

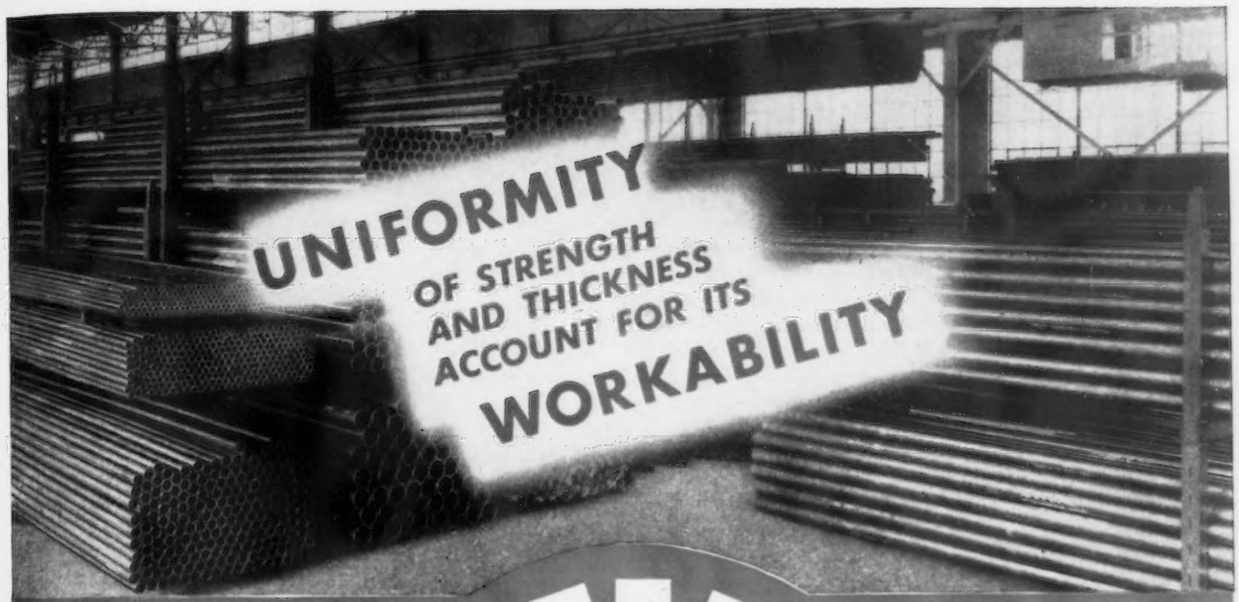
200 houses on one site—£1287—($5148)

500 houses on not more than three sites in a five mile radius—£1275—($5100)

501 or more houses on one site—£1267—($5068)

The technical details which the ministry is furnishing indicate that the basic features are similar to the experimental unit. The structural framework is of hot rolled sections, with roof trusses of tubular steel with welded joints. The ministry has paid particular attention to describing details of corrosion prevention, and it is thought that most of the changes since the designing of the prototype are in this regard. The frame is painted with red lead, and a coat of bituminous paint before delivery. Bolts and scratches are to be touched up at the site with paint.

External steel wall sheeting is hot dipped galvanized, and gets a further coat of dipped iron oxide paint. On the wall side the iron oxide serves as protection, and on the outside two additional coats of oil act as the decorative finish. Window sashes get the same treatment.

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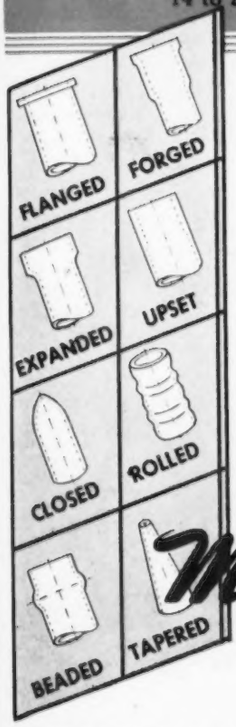
Minimum dimension ½"
Maximum dimension 2¼"
14 to 20 gauge.

**ROUND**

¼" to 4" O.D.
9 to 22 gauge




## The "Production Parts Tubing"

Because it re-forms and machines so well, Michigan welded steel tubing is widely used in the fabrication of production parts such as automobile exhaust and muffler tail pipes, gas tank filler tubes, steering jackets, and wherever bent and shaped tubes may be required. True concentricity, uniform I. D. and O. D. make it particularly economical when long runs are involved.

## Prefabricated Parts or Tubing

Michigan will furnish the complete part fabricated from welded steel tubing, all re-formed and machined. If you have the equipment and capacity in your own plant to do this work, consider Michigan as your source for tubing in the sizes listed above—commercial mill lengths or cut to special lengths.

*Engineering advice and technical help in the selection of tubing best suited to your needs.*

**Michigan STEEL TUBE PRODUCTS CO.**

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**DISTRIBUTORS:** Steel Sales Corp., Detroit, Chicago, St. Louis, Milwaukee and Minneapolis—Miller Steel Co., Inc., Hillside, N. J.—C. L. Hyland, Dayton, Ohio—Dirks & Company, Portland, Oregon—James J. Shannon, Milton, Mass.—Service Steel Co., Los Angeles, Calif.—American Tubular & Steel Products Co., Pittsburgh, Pa.—Strong, Carlisle & Hammond Co., Cleveland, Ohio—C. A. Russell, Inc., Houston, Texas—Drummond, McCall & Co., Ltd., Toronto, Canada.

# PERSONALS

ERNEST R. BREECH, executive vice-president and member of board of directors, Ford Motor Co., effective as of July 1.

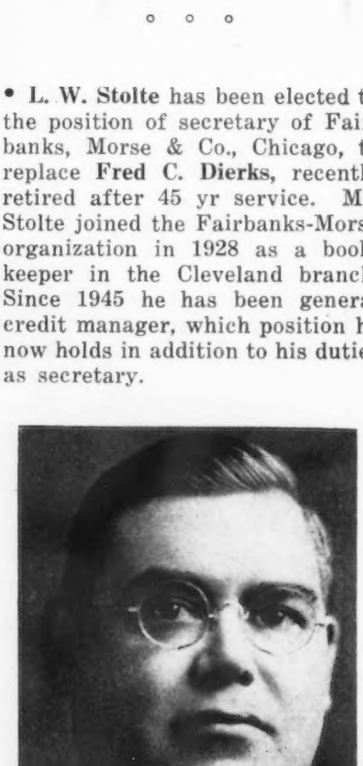
• **Ernest R. Breech** is resigning as president of Bendix Aviation Corp. and will join the Ford Motor Co., Dearborn, Mich., on July 1 as executive vice-president and member of the board of directors. He will remain a director of Bendix Aviation Corp. during the balance of 1946. The election of Mr. Breech to the board of directors of the Ford Motor Co. fills the vacancy created by the death of Frank Campsall. Prior to his association with Bendix, Mr. Breech was a vice-president of General Motors Corp.

• **Malcolm P. Ferguson** has been elected president of Bendix Aviation Corp., Detroit, to succeed Ernest R. Breech, who has resigned, effective June 30. Mr. Ferguson has been a director and vice-president of Bendix, and group executive in charge of its divisions producing automotive equipment, as well as fuel injection carburetors, direct fuel injection systems and struts and brakes for aircraft.

• **James M. Underwood** has been elected president of Vulcan Mold & Iron Co., Latrobe, Pa., succeeding Edward R. Williams, retired. During the greater part of the period from 1930 to 1940, Mr. Underwood served as assistant secretary-treasurer and assistant to the president of the company. He then became president of the Halund Co., Latrobe. He also was director of market research for Latrobe Electric Steel Co.

° ° °

• **L. W. Stolte** has been elected to the position of secretary of Fairbanks, Morse & Co., Chicago, to replace **Fred C. Dierks,** recently retired after 45 yr service. Mr. Stolte joined the Fairbanks-Morse organization in 1928 as a bookkeeper in the Cleveland branch. Since 1945 he has been general credit manager, which position he now holds in addition to his duties as secretary.



W. J. ADAMSON, general manager of sales, Allegheny Ludlum Steel Corp.

• **W. J. Adamson** has been named general manager of sales of Allegheny Ludlum Steel Corp., with headquarters at Brackenridge, Pa. Mr. Adamson has been with the company since 1936 and prior to his current appointment was serving as assistant sales manager in charge of carbon and magnetic steel sales.

• **L. E. Vail** has been appointed Titan Metal Mfg. Co. sales representative for Northern Ohio, with his headquarters at Cleveland.

• **Gordon E. Jones,** resident manager for the past 27 yr of the Bessemer, Ala. plant of the U. S. Pipe & Foundry Co., will retire May 31.

• **J. M. Matthews** has been made manager of silicon steel sales by Allegheny Ludlum Steel Corp., with headquarters at Brackenridge, Pa. He had been in Buffalo as district manager since 1937. **W. H. White** has been appointed manager of tool steel sales, Detroit district. **C. R. Mitchell,** formerly assistant district manager at New York, has been appointed district manager of Buffalo territory. **C. H. Vaughan,** formerly manager of tool steel sales, Detroit, has been named district manager of Birmingham district, and **C. H. Nesbitt** has been named assistant district manager of Birmingham. **W. A. Peterson,** Tool Steel Div., has been transferred from Chicago to the Milwaukee district.

• **Stanley Heck,** formerly in the purchasing dept. of National Research Corp. of Boston, has been made director of public relations and personnel.

• **H. A. Roemer, Jr.** has been elected president of the Detroit Seamless Steel Tubes Co., Detroit, and **J. H. Dunbar,** chairman of the board. Mr. Roemer, who has been executive vice-president of the company, succeeds Mr. Dunbar in the presidency. Mr. Dunbar succeeds **H. A. Roemer,** resigned, as chairman. Mr. Roemer, Jr., came to the Detroit company in May 1945. Previously he was an executive of Pittsburgh Steel Co., serving as assistant general manager of sales.

H. A. ROEMER, JR., president, Detroit Seamless Steel Tubes Co.

• **Marcus E. Bullard,** former assistant district purchasing agent of the American Steel & Wire Co., Worcester, Mass., has retired after 45 yr with the company. **Lynn H. Nicholson,** associated with the Worcester branch since 1925 and recently discharged from the army, has been made production superintendent of the electrical cable dept. **J. Roy Driscoll,** with the company since 1934, has been made superintendent, finishing and production planning of the same department.

• **R. B. Hammond** has been appointed general manager, secretary and treasurer of the Bellevue Industrial Furnace Co., Detroit. For the past 20 yr, he has been employed in various engineering and production capacities with the Fisher Body Corp., division of General Motors Corp. **E. W. Schoen** has been appointed metallurgical engineer of the company.

• **Herbert T. Florence** has been elected president and general manager of the Cleveland Crane & Engineering Co., Wickliffe, Ohio. He has been general manager of the company since 1938 and vice-president since 1941. **A. C. Garnett,** formerly secretary and treasurer, has been named vice-president and treasurer. **W. G. Wehr** has been made secretary, and **W. D. Vanderbilt,** assistant secretary.

**HERBERT T. FLORENCE, president and general manager, Cleveland Crane & Engineering Co.**

• **H. H. Wunderlich,** formerly assistant to the executive vice-president, has been appointed an assistant controller of the Jones & Laughlin Steel Corp., Pittsburgh. Mr. Wunderlich has been with Jones & Laughlin for 23 yr, having started with the company in the accounting dept. Since 1926 he has served in various capacities in the offices of the controller, financial vice-president and executive vice-president.

• **Fowler McCormick,** formerly president, has been elected chairman of the board, International Harvester Co., Chicago, in which capacity he will be in general and active charge of the business as well as chief policy making officer.

**FOWLER McCORMICK, chairman of the board, International Harvester Co.**

**Judson F. Stone,** whom Mr. McCormick succeeds, will continue to serve as a director and as a member of the executive committee of the board. **John L. McCaffrey,** formerly first vice-president, becomes president, and will act as chief operating officer of the company. **W. E. Worth,** formerly second vice-president, and **P. V. Moulder,** formerly vice-president in charge of the Motor Truck Div., have been elected executive vice-presidents. **W. C. Schumacher,** formerly sales manager of the Motor Truck Div., has been appointed to succeed Mr. Moulder as head of that division, with the title of general manager.

**KEEN JOHNSON, director of public relations, Reynolds Metals Co.**

• **Keen Johnson,** vice-president, has been named director of public relations for the Reynolds Metals Co. Mr. Johnson joined the Reynolds Co. several years ago as assistant to the president. Later he was made a vice-president. In his new position he will represent the company in the many phases of its public relations activities. His headquarters will be in Washington. **J. F. Van Kennen** has been named assistant general sales manager of the Aluminum Div. in charge of products, with headquarters in Louisville. Prior to this appointment, Mr. Van Kennen had been, since 1943, divisional manager for Reynolds aluminum sales with offices in Chicago. Mr. Van Kennen joined Reynolds 6 yr ago as a metallurgical field engineer. **Paul H. Fox** has been appointed divisional manager for aluminum sales of Reynolds for the central states area with headquarters in Chicago. He formerly was serving as division manager for the states of Washington, Oregon, Wyoming, Montana and Idaho. **Harry J. Williams** has been appointed eastern sales manager, Foil Div., succeeding **V. W. Moody, Jr.,** who has been transferred to headquarters at Richmond, Va. Mr. Williams has been with Reynolds since 1922. His headquarters will be in New York City.

• **Palmer W. Holmes** has been appointed manager of the new public relations dept. of Acme Steel Co., Chicago.

• **W. Bertram Weiss,** former captain of the U. S. Army, has been elected president of the Weiss Steel Co., Inc., Chicago. **R. C. Anderson,** formerly of Republic Steel Corp., South Chicago works, has been elected vice-president, and **Joseph F. Walsh,** secretary of the company.

• **T. P. Sands** has been named automotive engineer in the research dept. of Monsanto Chemical Co.'s Organic Chemicals Div., St. Louis. Mr. Sands had been associated with the Gulf Research & Development Co., Pittsburgh, for the past 10 yr.

• **Paul M. Johnson,** assistant superintendent of the openhearth dept., Campbell, Ohio plant, Youngstown Sheet & Tube Co., has been appointed superintendent of the company's Brier Hill openhearth dept. at Youngstown, Ohio. He succeeds **William J. Reilly,** who recently left Sheet & Tube to join the Ford Motor Co. **Charles E. Deterding,** with the company nearly 33 yr and turn foreman in the openhearth dept. since 1937, succeeds Mr. Johnson as assistant superintendent of openhearths at Campbell.

• **A. P. Hall** has been elected vice-president of American Chain & Cable Co., Inc., Bridgeport, Conn. He joined the company in 1944 and will continue his present duties as general manager of sales. His headquarters will remain at New York City.

A. P. HALL, vice-president, American Chain & Cable Co., Inc.

W. K. FITCH (left), chairman of the board, and CARL B. JANSEN (right), president, Dravo Corp.

• **W. K. Fitch** has been elected chairman of the board of directors, and **Carl B. Jansen** has been named president of Dravo Corp., Pittsburgh. Mr. Fitch replaces **J. D. Berg,** who resigned recently. Mr. Berg, designated as chief executive officer of the corporation, will retain his position as chairman of the executive committee. Mr. Fitch began his business career with Dravo-Doyle Co., a Dravo pioneer interest. In 1934 he became vice-president of Dravo Corp. and general manager of the Machinery Div. Mr. Jansen fills the unexpired term of V. B. Edwards, who died recently. Mr. Jansen, who was also elected to the executive committee, had been manager of the Contracting Div. since 1945. **Robert W. Marvin,** since 1942 general manager of the Engineering Works Div., has been elected vice-president and member of the executive committee, and **W. E. Clark** has been elected a member of the board of directors. He has been general manager of the Keystone Div. for the past year.

• **Robert F. Golden** has been appointed to head the newly established research and development dept. of the Eaton Mfg. Co., Massillon, Ohio. Mr. Golden was formerly with the National Lock Washer Co. where he was assistant to the president.

• **Arthur W. Johnson** has been appointed assistant manager of sales, Chicago district, U. S. Steel Supply Co. He joined the firm in 1914 and for the last 19 yr has been a salesman in the Chicago district.

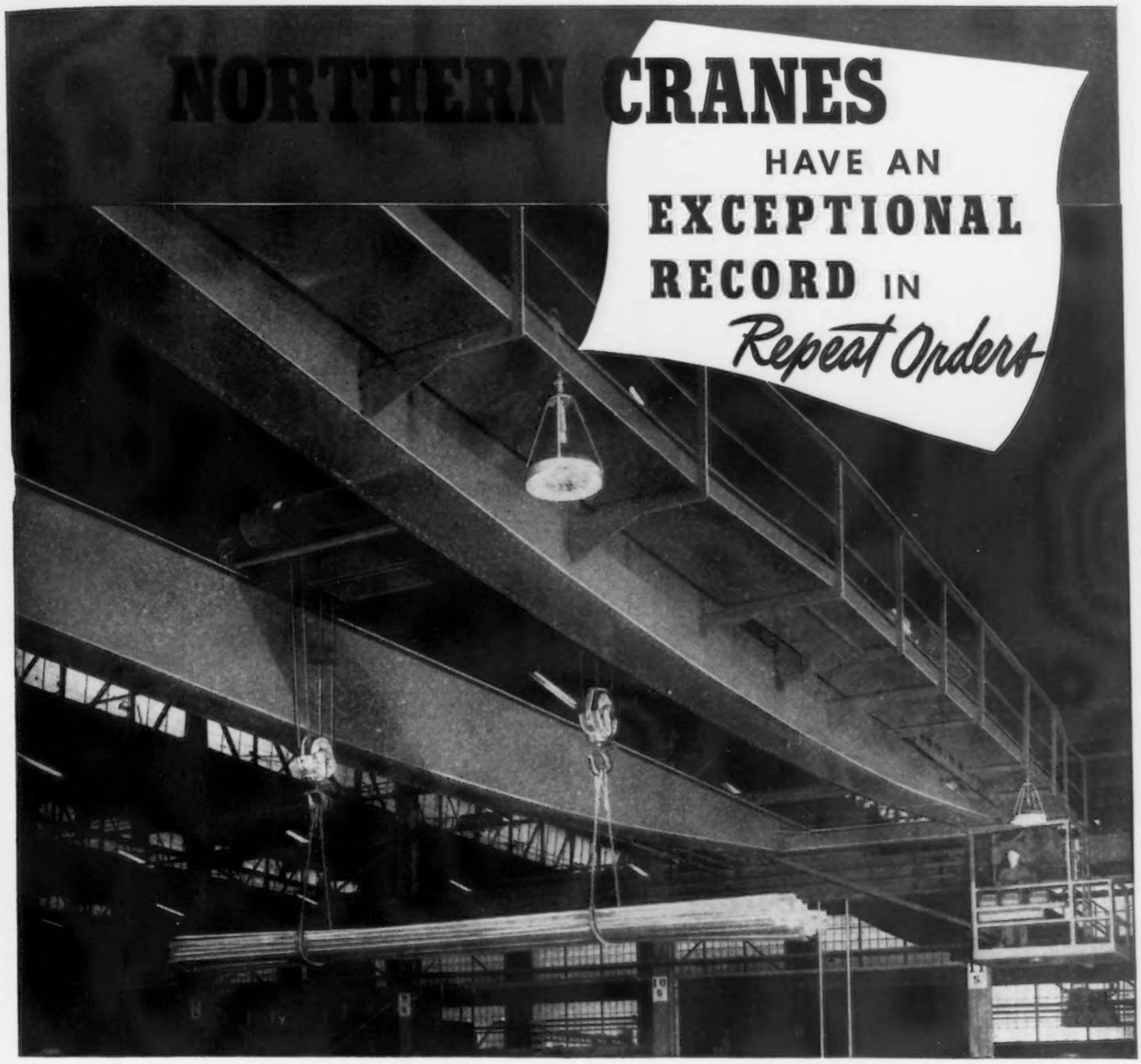
• **James Southworth,** for 27 yr with Brown & Sharpe Mfg. Co., has been made superintendent of Bathgate Foundry, Inc., Worcester, Mass.

• **R. G. Rehder** has been made president and treasurer of Uddeholm Co. of America, Inc., New York, filling a vacancy made by the resignation of **E. T. Corbus,** who has become chairman of the board of directors. Mr. Rehder for the past 21 yr was head director of Uddeholm General Agency, Ltd., Birmingham, England, which agency distributed the steel products of the Uddeholm Co. of Sweden in the same manner as is being done by Uddeholm Co. of America.

## OBITUARY...

• **Thomas W. Reilly,** general foreman of the shipfitting dept., Federal Shipbuilding & Dry Dock Co., Kearny, N. J., died recently.

• **R. F. Devine, Jr.,** president and treasurer of the Erie Forge Co. and its subsidiary, the Erie Forge & Steel Co., Erie, Pa., died May 21.




Cranes are long wearing machines—do not, ordinarily, stand high in repeat business.

But Northern Cranes have built an exceptional record in repeat orders. A large proportion of our customers regard us as their prime source of cranes—reorder from us when new crane equipment is needed.

One customer has bought 645 Northern Cranes over a period of years. Many customers are regular purchasers—have large numbers in operation.

Repeat business of this sort is obtained only by the very highest quality—the type of quality built into Northern Cranes.

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AIR HOISTS • SPECIAL CRANES AND HOISTS

# Dear Editor:

## CANADIAN ALUMINUM

Sir:

We have read with attention the article "Canadian Aluminum Price Cut May Capture World Market" which appeared in the issue of May 9. . . . In the interest of first-class reporting we might offer some assistance in pointing out an inconsistency between this article and a previous article. In the May 9 article you refer to Aluminum Ltd. as a "foreign sales subsidiary" of the Aluminum Co. of Canada. This is an error of fact. Aluminium Ltd. (spelled with an *ium* ending) is a Canadian company which owns and holds various aluminum interests in several countries. . . . the Aluminum Co. of Canada, Ltd., while it is the largest and principal operating unit, is a subsidiary in the Aluminium Ltd. group of companies. It is not accurate, therefore, to relegate the parent company to the position of a "foreign sales subsidiary."

*D. C. CAMPBELL*
*Aluminium Fiduciaries, Ltd.,*
*Montreal*

● We plead guilty to confusing the relationship of the subsidiaries, but the print shop will have to assume the blame for the misspelling of "aluminium." It was spelled correctly in the original copy.—Ed.

## OPA TANK PRICE

Sir:

We have heard that the OPA has permitted a price increase on fabricated oil and gasoline tanks and septic tanks. Can you tell us whether this is rumor or fact? We cannot find what government department we must go to to find this out; we are never notified, and at present prices we are practically giving our tanks away.

*F. E. TOWNLEY,*
*Manager*
*O-Gas-Co Sales Co.,*
*Schenectady*

● Here is the present situation, according to OPA: On Jan. 29 a price increase of 11 pct was granted in manufacturers' prices of hand operated gasoline, kerosene, lube oil and grease dispensing equipment, including accessories and repair and replacement parts, which are part of such equipment. Where tanks have dispensing equipment attached to them, they, as part of the unit, share in the price increase. On Apr. 8 a price increase of 17 pct was announced covering septic tanks. This authorization affects tanks of 585 gal capacity or smaller and those not using metal heavier than 7 gage. Copies of these two orders are being forwarded to you.—Ed.

## TOOL STEEL DIRECTORY

Sir:

We have tool steels assigned to us as surplus property and in many cases the trade name is difficult to identify. We understand that your "Directory of Tool Steels" would be of great assistance to us. If possible we would like to obtain a copy of this publication.

*K. J. BURKHOLDER,*
*Supervisor*
*War Assets Administration,*
*Cleveland*

● The new and revised edition of THE IRON AGE "Directory of Tool Steels" has just come from the printers and a copy is being mailed you. This directory, which covers tool, metal-cutting and die steels and sintered carbides, is available to readers at the following prices: $1 for a single copy, $1.50 for two copies; $2 for three copies, and 50¢ each for five or more copies.—Ed.

## FEEDING CASTINGS

Sir:

In the Mar. 14 issue, you published a report in "Newsfront" relating to lower scrap losses, easier cleaning and better grain structure in both ferrous and nonferrous castings . . . by using certain compounds in the gate of a mold. Would you be good enough to advise us where we can obtain further information on this matter?

*F. SELL,*
*Purchasing Agent*
*Tri-Clover Machine Co.,*
*Kenosha, Wis.*

● The material referred to is Thermotomic, marketed by Pittsburgh Metals Purifying Co., Pittsburgh. The use of this compound has since been described in detail in the article, "A New Feeding Technique for Castings," in the Apr. 25 issue, p. 62.—Ed.

## SILICON-IMPREGNATED STEELS

Sir:

We would appreciate receiving tear sheets of the article entitled "Silicon-Impregnated Steels" by Harry K. Ihrig, which appeared in the Apr. 4 issue.

*RICHARD P. SEELIG*
*Chief Engineer*
*Powder Metallurgy Corp.*
*Long Island City, N. Y.*

## NITRIDING AIRCRAFT STEELS

Sir:

I would like to receive a copy of the article by P. A. Haythorne entitled "Nitriding of Aircraft Steels" which appeared in the Jan. 31 issue.

*JOHN FAIRCHILD*
*Yard Inc.*
*Pasadena, Calif.*

## KIRKSITE PRODUCER

Sir:

We are interested in Kirksite A, which was mentioned in the Mar. 14 issue, p. 74. Could you give us the name of the producer?

*H. M. PATTERSON*
*Eastern Sales & Engineering Co.,*
*Baltimore*

● The producer is National Lead Co., 111 Broadway, New York.—Ed.

## IRON POWDER

Sir:

We should like to have further information regarding commercial iron powder 100 to 200 mesh, 96 pct Fe, as quoted by your publication at 12½ to 15¢ per lb. We would like to know the method of manufacture, composition, and whether it is suitable for compacting, and also the price delivered, c.i.f., London.

*E. H. HEWITT,*
*Raw Materials Div.*
*George Cohen Sons & Co., Ltd.,*
*London, W.6*

● This product is made by pulverizing low alloy or carbon steel scrap followed by a gaseous reduction with hydrocarbons to produce iron, the resulting product being suitable for compacting. The remaining 4 pct is about 2 pct iron oxide and small quantities of manganese, silicon, phosphate and sulfur. Your inquiry is being forwarded to several producers for price quotations delivered, London.—Ed.

## CARBON DETERMINATION

Sir:

Referring to the item "Carbon Determination" on the "Dear Editor" page, May 9, the article "Combustion Train for Carbon Determination" by J. B. Stetser and Norton appeared in the issue of Aug. 22, 1918, pp. 443 to 445. The volume is No. 102, not 120. . . .

*E. H. McCLELLAND*
*Carnegie Library of Pittsburgh,*
*Pittsburgh*

● Our thanks, too, to Mr. Neuman, Mellon Institute of Industrial Research, University of Pittsburgh, who also pointed out the proper volume in which this article appeared. This information is being forwarded to Touzart & Matignon, Paris, who originated the inquiry.—Ed.

## GAS-FIRED RADIANT TUBES

Sir:

Will you please send me names of the makers of the gas-fired radiant tubes mentioned in "Newsfront" in the issue of Apr. 11.

*J. C. TURNBULL,*
*Development Engineer*
*Scaife Co.,*
*Oakmont, Pa.*

● The tubes, designed for high-temperature heating, are a development of the Gas Machinery Co., Cleveland, and were described at a recent meeting of the American Gas Assn.—Ed.

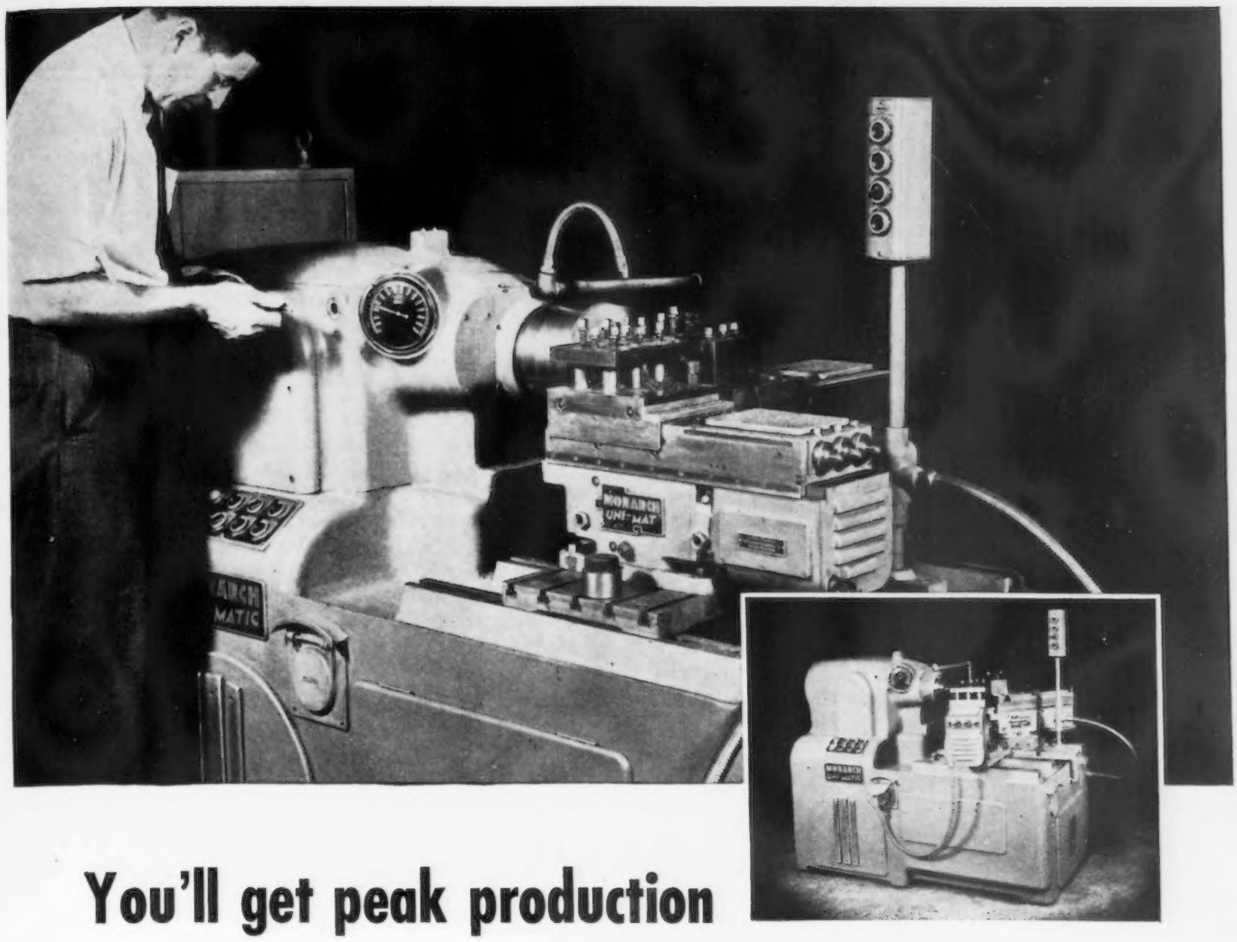
## HEAT TREATMENT

Sir:

Please advise me if reprints of the five-installment article "Heat Treatment of High Speed Steel" by Cohen and Gordon are available.

*H. C. MINTON, JR.,*
*Research Dept.*
*Winchester Repeating Arms Co.,*
*New Haven, Conn.*

● Reprints of the article have been made by the Vanadium Alloys Steel Co., Latrobe, Pa. Suggest you write the company, attention of Mr. J. C. McKenna.—Ed.



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These are just a hint of some of the revolutionary features you'll find in the Uni-Matic . . . for chucking and fixture work as small as 1″ and as large as 16″ diameter. It's the machine that brings automatic production within reach of every shop, no matter how large or how small the lots.

You'll get minimum machining costs as only you can with specialized automatic production. Best of all, when you change your design you don't change Uni-Matics. Just tailor the tooling to fit your new operation—it's only a few hours' job. The Uni-Matic is universally adaptable.

*** UNI-MATIC** — Add this new name to your metal-turning dictionary—you'll be hearing a lot of it—wherever rising production costs are a factor. The *Uni-Matic* is Monarch's answer to this problem in the field of chucking and fixture work. For between-centers work it's the *Mona-Matic:* for hand screw machine work, the *Speed-Matic.*

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# This Industrial Week . . .

- ***Prospects for End of Coal Strike Brighter***
- ***Steel Loss to Be Over 4 Million Tons***
- ***Ingot Rate Down 5 Points to 44 Pct***

PROSPECTS of the coal miners going back to work next Monday were brighter early this week than at any time since the crippling walkout took place on Apr. 1. With the government having taken over the mines, it is logically expected that Mr. Lewis will get all or most of what he wants in the way of welfare fund and a wage increase. Whether or not the hurdle of union organization of supervisory employees can be overcome remains to be seen.

Belief among coal operators privately is that they have lost their battle against a health and welfare fund which will probably amount to 50¢ a ton including some money which is already being taken from miners' pay for welfare purposes.

When the coal strike finally ends, it will take from one week to 10 days before an ample flow of coal will reach steel plants whose supply has practically disappeared. A stepup in steel operations, should the strike end next week, would be small and pre-strike output is not expected to be reached until at least three weeks after the men return to the mines.

THE tonnage of steel ingots lost by reason of the coal strike to the end of this week amounts to about 4,000,000 tons and an additional loss will be incurred next week of about 350,000 to 400,000 tons even if the pits are reopened on Monday. If the strike is not called off then the steel industry will lose close to 1,000,000 tons of steel production during next week.

Steel output this week is estimated at 44 pct of rated capacity compared with 49 pct a week ago and compared with 89.5 the week before the coal strike. District operating rates this week which in some cases have reached the lowest point since the steel strike are as follows: Pittsburgh 28.5 pct, Chicago 59.5 pct, Youngstown 30 pct, Philadelphia 20 pct, Cleveland 64 pct, Buffalo 44.5 pct, Wheeling 50 pct, Birmingham 46 pct, Detroit 95 pct, West 58 pct, Cincinnati 69 pct, St. Louis 53 pct, and East 88.5.

Wide variation in operations between steel firms and geographical areas has completely muddled the general steel market situation. While some customers who are fortunate in having received steel supplies from companies able to maintain a high operating rate in the face of the coal strike are well fixed on some items, they are short on others needed to complete production cycles.

FURTHERMORE, most steel companies which are able to maintain a fair finishing mill schedule have laid emphasis on the production of those items which yield a better profit such as cold-rolled sheets, cold-rolled strip and certain bar specialties. In the case of steel companies drastically affected by the coal strike, finishing mill operations are closed down in many cases and in others are limping along.

Steel order volume has fallen off somewhat in the past week as customers find little reason to place business until the strike issues are settled. There is a general revision of existing orders underway on steel mill books with cancellations running high in some cases. This situation, however, has no significance toward the long-term pull. It is merely an indication that steel companies and their customers alike must completely revise their requirements for future production.

It is now certain that the total steel loss to American industry since the first of this year because of strikes and slowdowns will exceed 12,000,000 tons. The continual shutting down and starting up of coke ovens, blast furnaces and openhearth steel units has so upset regular production and maintenance schedules that operators will be finding production difficulties for some months to come. Equally as serious is the continued unbalance in customers' inventories which will prevent a near-term completion of even drastically revised quotas.

Another serious aspect of the current steel situation is the failure of some customers to obtain steel supplies greatly needed at a specific time because of the seasonal character of their business. Farm implement makers who must produce implements at a given time in order to have the machines in the hands of the farmers when needed for seasonal use are finding some of these markets gone.

ANOTHER case in point involves the canning industry which must have containers when the packing season calls for them. Most can makers are short of supplies and if the maximum amount of food is to be packed this year, a hasty end to low steel output must be reached.

The tight steel situation involving products for automobile manufacture has caused the Kaiser-Frazer Corp. to find means of obtaining new sources of supply. While the official statement indicated that the company had agreed to buy an interest in a Midwest steel firm which would take over the operation of a plant in the Midwest, it is known that the Kaiser-Frazer Corp. for some time has been considering the purchase of some companies capable of supplying semi-finished steel or sheets and which are believed to be located in the Midwest. This latter territory generally means the Ohio Valley, parts of western Pennsylvania and as far west as Cincinnati.

The shortage of scrap despite the low steel operations has reached the point where a crisis in the supply of this raw material may be reached when steel companies begin to lift their operating rates.

• **CHAOS CONFOUNDED**—Most steel production and order men are ready for the booby hatch according to gleanings picked up at New York during the Institute's annual meeting. The number of strikes and shutdowns since the first of the year has put delivery promises so far behind that complete revisions will have to be made on all schedules. On top of these troubles the close connection between output in the openhearths and finishing mills has been scattered to the four winds. It will take more than a month to get inventories properly balanced in the steel mills so that economical runs can be made on finishing mills. Consumer pressure is sure to mount to new frenzies once the coal strike issues have been settled, with old line customers attempting to put the heat on for quick deliveries. Judging from the condition of steel books and rolling mill schedules, attempts to get preferred deliveries will come to naught.

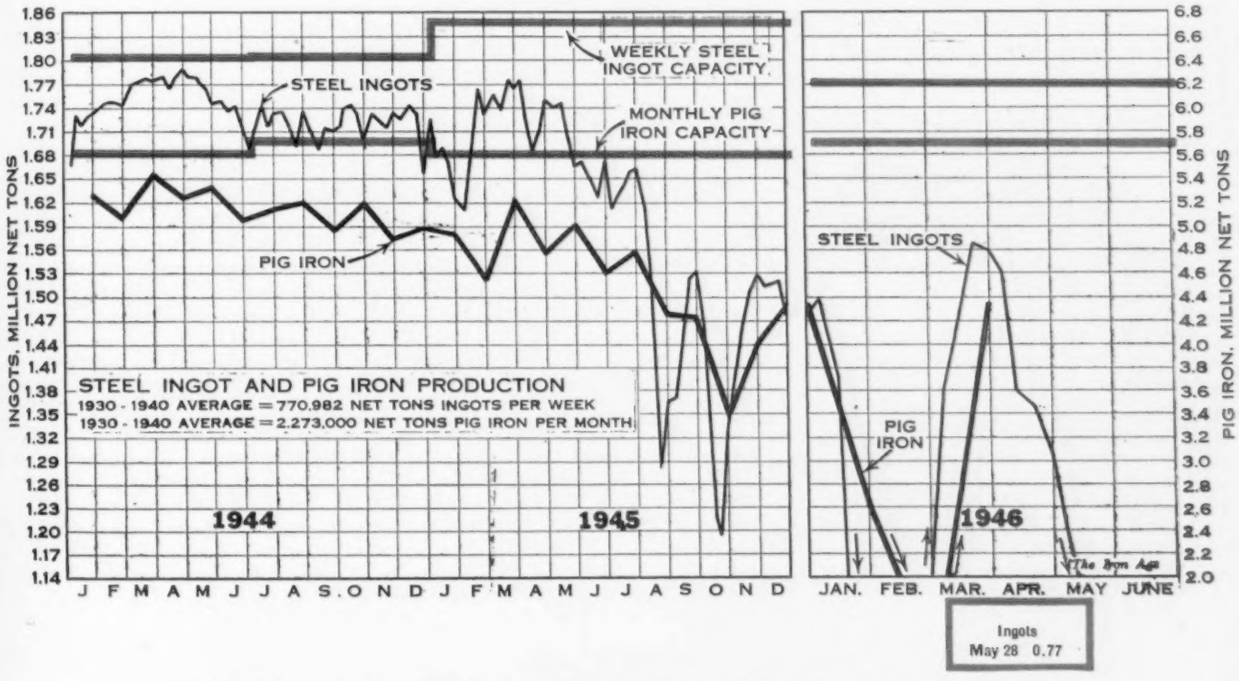
• **UNDERGROUND ORE MINING**—Production is expected to mount rapidly this week at underground iron ore mines on Michigan's Upper Peninsula following last week's settlement of their extended strike. Necessary rehabilitation and repair of workings kept production down last week. Settlement resulted when operators finally gave in to the long standing demand of the CIO United Steel Workers Union for an 18½¢ per hr wage increase.

• **GERMAN STEEL IN U. S. ZONE**—About 2800 tons finished steel, 1500 tons ingot and 3750 tons pig iron were produced during week ended May 11 by four mills operating in the United States Zone, according to a cable to the War Dept. from the Military Government in Germany. Figures for the previous week were 2200 tons, 550 tons and 3400 tons respectively.

• **TINPLATE OUTLOOK**—The steel, coal and train strikes will make themselves felt for sometime in the available supply of tinplate. While all mills have put this item on a more or less preferred list because of its importance in the food situation there is bound to be a shortage before packing seasons are over. Many foods have been off grocers' shelves for weeks with no chance of supplies until new packs have been completed. Demand for tinplate as new packs come in should establish a record and pressure for shipments will be heavy. Tinplate is one item which must reach canneries in time to anticipate canning requirements or else food is lost and packs can not be properly cared for.

• **RAILROAD CAR INQUIRIES**—Union Pacific is reported inquiring for 1000 fifty-ton box cars and 500 fifty ton steel auto box cars, and Kansas City Southern for 100 seventy-ton pulpwood cars. Recent awards include 150 drop end gondolas to Harlan & Hollingsworth by Pittsburgh & West Virginia, and 125 seventy-ton covered hoppers by Central Railroad of New Jersey. Illinois Terminal Railroad has awarded 200 fifty-ton box cars to American Car & Foundry Co.

• **ADJUSTABLE PIG IRON PRICING**—Adjustable pricing may soon be extended to producers and sellers of pig iron, according to Washington reports. In short supply, CPA has held pig iron as one of the probable bottlenecks in the housing program unless either higher prices or premium payments are provided. Reliable sources say OPA is making a study of the price structure and that adjustable pricing may be ordered soon pending completion of the survey.




## *Steel Ingot Production by Districts and Per Cent of Capacity*

| Week of | Pittsburgh | Chicago | Youngstown | Philadelphia | Cleveland | Buffalo | Wheeling | South | Detroit | West | Ohio River | St. Louis | East | Aggregate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| May 21..... | 41.0 | 58.0 | 37.0* | 41.0 | 74.0* | 30.0* | 59.0 | 46.0 | 95.5 | 59.0 | 69.0 | 59.0 | 86.0 | 49.0 |
| May 28..... | 28.5 | 59.5 | 30.0 | 20.0 | 64.0 | 44.5 | 50.0 | 46.0 | 95.0 | 58.0 | 69.0 | 53.0 | 88.5 | 44.0 |

* Revised.

# AO Respirators

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**COMFORTABLY**

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**EXACTLY**

The AO R-1000 Respirator establishes new standards of safety and comfort for workers requiring protection from dusts, gases and vapors. It is really seven respirators in one, as it may be fitted with any of seven interchangeable cartridges designed for protection against specific hazards.

The AO R-9100 Respirator—for protection against nuisance and pneumoconiosis-producing dusts—weighs less than 2 ounces—fits snugly and comfortably on all types of faces—both men's and women's. (AO R-9100T for protection against *toxic* dusts.)

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American Optical COMPANY *Safety Division*

SOUTHBRIDGE, MASSACHUSETTS
BRANCHES IN PRINCIPAL CITIES

AUTO STEEL BY-PASSES THE RAILROAD: *Inland Steel Co. has minimized its worries in getting steel to Detroit automobile manufacturers by recent acquisition of "The Inland", a motorship, which operates directly from the company's Indiana Harbor, Ind., docks to Detroit and Lake points.*

# *Rail Freight Hike Would Drastically Affect Steel Mill Return*

*Chicago*

By CHARLES T. POST

o o o

• • • **If the railroads,** which have extended their palm for a 25 pct freight rate increase on the basis of higher costs and lower income, are in any part as successful as organized wage earners have been with similar pleas, both delivered steel costs and mill net returns will do some fancy hopping in certain parts of the country.

Mills whose principal markets are closer than applicable basing points stand to increase their net returns immediately without even saying "boo" to the Office of Price Administration. Particularly favorably located are producers located between the Mississippi and the Rockies whose pricing is on a Chicago or Birmingham base. Colorado Fuel & Iron Corp., for instance, whose sales to the trade are priced by adding freight to the Chicago base price, will hardly have cause to shed tears at a freight rate increase. Its golden dream could soon be dispelled, however, if the new owner of the government's Geneva, Utah, steel plant established a new basing point there on competitive products.

Despite persistent plugging by the industry for higher base prices on steel, a higher mill net has jumped out of the economics textbooks as the No. 1 target of steel producers. This has been clearly demonstrated through a mass stampede of sellers from markets in which freight must be absorbed, notably the exodus of eastern mills from the Chicago market. Higher freight rates will tend to delay the return of sellers to outlying markets when nearby buyers become scarcer, and to this extent the railroads will have lost some traffic forever. In the long run, freight increases stand as one more force encouraging steel producing units near centers of consumption (See THE IRON AGE, May 16, 1946, pp. 92-95).

In the immediate period of steel scarcity, the mills which stand to benefit by being located closer to their markets than to applicable basing points will be doubly blessed. The same higher freight which they can tack to their bills will discourage less favorably located competitors from absorbing freight to serve these markets when plenty of business can be found closer home.

Had the trend toward establishment of basing points near points of production, which appeared in late 1945 and early this year, gained momentum, the probable freight increases would be less important at this time. Instead, following establishment of new basing points on stainless steel, electrical sheets, and tinplate, the rush subsided. Predictions that the industry would soon have, with OPA encouragement, basing points near all important production centers, appear less well founded today. The Federal Trade Commission, which thought natural forces were about to accomplish what it had attempted to do unsuccessfully for years, finds its vicarious victory only partial.

The railroads, who feel that other forms of transportation will also have to raise rates sooner or later, see little permanent loss of traffic in the rate move. John E. Tilford, vice-president in charge of traffic, Louisville & Nashville Railroad, told the Interstate Commerce Commission "obviously an increase in railroad rates will cause some diversion of traffic, but both truck and water carriers are facing increased wage and material costs just as are the railroads, with the same kind of need for increased rates."

This reasoning may be wrong insofar as a substantial portion, though not a majority, of steel traffic is concerned. A corresponding percentage of increase in water rates, which are lower than rail, would widen the present gap between the two. In many instances, a small push is all that is needed to drive the business to water carriers. A recent indication that the

steel producers are not irrevocably wedded to the railroads is the recent acquisition by Inland Steel Co. of a motor ship to carry finished steel to Detroit and other Lake consuming points. The disadvantageous rail tariffs confronting Pittsburgh mills is pointed up by the probability that U. S. Steel will build an East Coast mill to take advantage of water transportation. And high freight rates may yet prove to be the straw that breaks the Geneva, Utah, mill in West Coast competition.

Railroad representatives, themselves, have set the cue for the steel industry to consider further increases as factors in locating new plants. Walter S. Franklin, vice-president in charge of traffic, Pennsylvania Railroad—one of the roads which has heavy steel industry traffic hanging in the balance—testified before the ICC that, beyond the present proposed increase, further increases will probably have to be obtained in order to provide the necessary earnings to keep the railroads in a sound financial position.

Even those mills rolling steel rails, whose sale is on the general basis of reciprocity for amounts of raw materials and finished steel carried, are less careful of stepping on railroad toes now that this low profit business has lost importance. Withdrawals from the track spike and bolt business have been hard-boiled. E. G. Plowman, vice-president—traffic, U. S. Steel Corp., laid the issue on the line in a recent address before the New York Traffic Club. He acknowledged the "great need and demand for railroad transportation in the immediate future—say during the next five years." Then he went on to say that the railroads' "status in the future depends in part, at least, on their present success in making it unnecessary to turn to other forms of transportation for needed services which the railroads can perform with relatively greater efficiency."

## *Kaiser-Frazer Seen Acquiring Steel Plants*

*New York*

• • • **Kaiser-Frazer Corp.'s** announcement that it has agreed to buy a substantial interest in "a new steel company" which will take over a Midwest steel plant has caused a stir in steel circles. Henry J. Kaiser, chairman of the company, refused to divulge the name of the steel company or the plant to be acquired, but indicated that the details would become public within the next week or two.

Efforts to confirm the purchase of Wheeling Steel Corp.'s Portsmouth, Ohio, plant have met with "no comment" by both the Kaiser-Frazer Corp. and the Wheeling Steel Corp. It is believed, however, that this plant (which has an annual steel capacity of 616,000 tons and equipment now including a blooming mill, bar mill and a billet and sheet bar mill) is one of several which have been considered by Mr. Kaiser. Latest records indicate that the sheet finishing mills were dismantled in 1939. Other products include a list of wire and similar items.

The focus of attention for steel concerns which can break down ingots or roll sheets for the Kaiser-Frazer Corp. is in what is known as the Midwest—a territory which is generally accepted as including Ohio, certain parts of western Pennsylvania, and surrounding territory.

The effort to obtain finishing steel outlets by Kaiser-Frazer is the result of the tight sheet situation in automotive body items. Strikes and huge backlogs have prevented steel companies from giving much service to some of their old customers let alone new concerns such as Kaiser-Frazer. Apparently taking the bull by the horns Mr. Kaiser hopes to acquire controlling interest in two or more smaller concerns in order to have an independent source for semifinished or finished steel products, made from Fontana, Calif., ingots. These are being shipped East at the present time.

## *Discloses British Steel Plan*

*London*

• • • **Disclosing for the** first time the various sections of the steel industry to be included in the British Government's nationalization program for steel, Minister of Supply John S. Wilmot indicated that the government will start with ore mines and coke ovens.

The program will continue through and take over the manufacture of pig iron for all purposes, the manufacture of steel ingots from pig iron or scrap and will also include primary or heavy rolling mills and various finishing operations, "so closely integrated with actual steelmaking as to be virtually one continuous process."

In cases of nonintegrated finishing (there are many) the government will review the companies firm by firm before deciding boundary lines.

**PREMATURE PICKETS:** *Railroad pickets beat the gun last week and formed lines around Jones & Laughlin Steel Corp. Some steelworkers refused to pass the lines. All during the coal strike J&L has run at top speed because of sufficient coal stocks built up during the steel strike in January.*

# Alcoa Plans Constructing New Plate and Sheet Mill at Davenport

o o o

By T. E. LLOYD

o o o

***Pittsburgh***

• • • **With the recent** announcement of the Aluminum Co. of America that it would construct a new mill at Davenport, Iowa, for rolling aluminum sheet and plate, plans were complete for expanding the company's flat-rolled capacity to 770,000,000 lb a yr. The plant, which will cost more than $30,000,000, will have the capacity to produce about 120,000,000 lb of sheet and plate a yr when placed in operation, and construction will begin as soon as the project is approved by the Civilian Production Administration. Construction time is estimated at about 18 months.

War capacity of flat-rolled aluminum, owned by Alcoa, was estimated at 804,000,000 lb, but economical capacity for peacetime operation is reported by the company at closer to 650,000,000 lb. The new mill will reduce ingot to finished products, the sheet ingot being cast right at Davenport. Pig needed will be shipped mainly from the Alcoa, Tenn., plant. Under present plans, the proposed plant will be capable of handling sheet up to 120 in. in width, and equipment for the plant is such that it can handle sheet and plate of super-strong aluminum alloys as well as the more common commercial alloys.

In addition to the present sheet rolling plants owned by Alcoa at Alcoa, Tenn., Edgewater, N. J. and New Kensington, Pa. (the latter now used chiefly for rolling magnesium sheet), Aluminum Co. of America operated two DPC plants during the war, one at Trentwood, Wash., and the other at Chicago. The former of these DPC plants was leased recently to Kaiser and the latter to Reynolds Metals Co. These plants each had a peak war capacity of 288,000,000 lb of sheet products a yr, which probably has been re-estimated from a commercial standpoint and adjusted downward since the end of the war. The only other sheet mill of any large consequence in the country is the Reynolds mill at Listerhill, Ala., which had a war capacity of 174,000,000 lb a yr. The remaining sheet and flat rollers of aluminum, totaling five, had a combined war capacity of 4,500,000 lb a year. These producers were: Aluminum Goods Co., Manitowoc, Wis.; Aluminum Products Co., La Grange, Ill.; Fairmont Aluminum Co., Fairmont, W. Va.; Sheet Aluminum Co., Jackson, Mich.; and United Smelting Co., New Haven, Conn.

The new Davenport mill to be erected by Aluminum Co. of America will give the company a better position in the Middle West, the area of the greatest outlet for metal goods. Further, the position is strategic for far western consumption since rail facilities are excellent and the plant will be on the Mississippi River. Alcoa was definitely interested in acquiring the Chicago sheet mill from DPC, but, despite its efforts, the plant was awarded to Reynolds Metals Co.

As a matter of course, these DPC plants have been awarded to companies other than Alcoa because of the monopoly charges made against the company some time ago. This situation is true in the disposal of alumina and aluminum reduction plants as well. Of the more economical plants for producing alumina disposed of by DPC, Reynolds got the Hurricane Creek, Ark., plant and Kaiser Cargo, Inc., obtained the Baton Rouge, La. plant. Of the aluminum reduction plants leased to date, Reynolds took a lease on half the Jones Mills, Ark., plant and the Troutdale, Ore., plant, and Kaiser got the lease on the Spokane, Wash., plant. Still to be leased by DPC through the Surplus Properties Administration are the plants at Burlington, N. J., Los Angeles, Queens, N. Y., Riverbank, Calif., Massena, N. Y., and Tacoma, Wash. The first four of these, however, have been deemed "Not Economically Situated" by the SPA, and probably will be closed down permanently.

The new Davenport plant to be built by Alcoa will produce sheet and strip in cut lengths and coil form, and plate. One interesting feature is the fact that Alcoa emphasizes that the new plant will be able to roll aluminum plate in sizes fully covering marine shipbuilding needs.

The hot mill equipment will center around a one-stand, four-high reversing break-down mill with edging rolls for large ingot breakdown and a five-stand, four-high sheet mill. These mills, it is believed, will be built by Mesta.

**OFFICIAL NUTCRACKERS:** *The rail strike was settled quickly but these two men, J. A. ("Cap") Krug, Secretary of the Interior and Vice Admiral Morrell, his Deputy Coal Mines Administrator, have a tough nut to crack in getting the mines back into production. No contract, no work is the hurdle that proved to be the reason for no coal to the Nation's industries.*

## Thomas-May Stockpiling Bill Passed by House; Goes Back to Senate

*Washington*

• • • **Without dissent, the** House on May 25 accepted and passed the Thomas-May Stockpiling Bill without floor change from the amended form recommended by its Military Affairs Committee. Having been already passed by the Senate, the measure goes back to that body for concurrence.

The House-approved bill differs from the Senate version only in four major respects: (1) Instead of establishing a new agency to administer the peacetime stockpiling, the House measure leaves control in the hands of the Secretaries of War and Navy; (2) instead of authorizing unlimited appropriations, funds have been limited to a total of $1.8 billion for the next 5 yr with a specific limitation to $360 million in each year; (3) instead of requiring funds received from sales to be turned into the Treasury as miscellaneous receipts, they are to remain available for the stock-piling program; (4) deletion of the Senate proposal permitting duty-free importation of materials purchased from foreign sources.

Under the terms of the measure's "Buy American" clause, strategic minerals and materials concerned in the bill must be purchased in the United States if possible.

Strategic materials are generally defined as those on which supply reliance must be placed on foreign resources and critical materials are considered those which present a difficult but less serious procurement.

As listed by the Munitions Board, in priority order, strategic materials are: Manganese, chromium, tin, tungsten, nickel, quartz crystals, aluminum, antimony, iodine, mica and mercury.

The Board lists critical materials alphabetically as follows: Abrasives, arsenic, asbestos, cadmium, copper, cryolite, fluorspar, graphite, helium, iron and steel, lead, magnesium, molybdenum, petroleum, phosphate, platinum, potash, refractories, sulfur and pyrites, titanium uranium, vanadium, zinc, and zirconium.

### Coming Events

**June 2-7 Society of Automotive Engineers, summer meeting, French Lick, Ind.**

**June 3-5 American Gear Manufacturers Assn., annual meeting, The Homestead, Hot Springs, Va.**

**June 13 Metal Powder Assn., spring meeting, New York.**

**June 17 American Society of Mechanical Engineers, machine design group, first session, Detroit.**

**June 17-18 American By-Product Coke Institute, first annual meeting, Seaview Country Club, Absecon, N. J.**

**June 17-20 American Electroplaters Society, annual convention, Pittsburgh.**

**June 24-28 American Society for Testing Materials, annual meeting, Buffalo.**

**July 22-23 American Washer & Ironer Manufacturers Assn., French Lick, Ind.**

**Sept. 10-14 American Chemical Society, exposition, Chicago.**

**Sept. 11-12 Society of Automotive Engineers, national tractor meeting, Milwaukee.**

**Sept. 16-20 Instrument Society of America, first conference and exhibit, Pittsburgh.**

**Oct. 1-4 Iron & Steel Exposition, Cleveland Public Auditorium, Cleveland.**

**Oct. 3-5 National Electronic Conference, Chicago.**

**Oct. 3-5 Society of Automotive Engineers, aeronautic meeting and display, Los Angeles.**

**Oct. 28-30 American Gear Manufacturers Assn., semi-annual meeting, Chicago.**

**Nov. 7-8 National Founders Assn., annual meeting, New York.**

**Nov. 18-22 National Metal Congress and Exposition, annual meeting, Atlantic City, N. J.**

## Ingot Mold Orders Off Awaiting Coal Peace

*Pittsburgh*

• • • **Ingot mold** manufacturers are awaiting the end of the coal strike for an upswing in business, a fact that has a saving grace in that they are currently squeezed pretty tight on both pig iron and coke. New orders are pretty scarce for molds, and even contract business has sloughed off sharply. However, with the difficulty that mold producers have in getting sufficient iron and coke, the slackness in business is nearly welcome. Most mills are down fairly low on supplies of mold strings, but are awaiting resumption of full-scale steel operations after the coal strike to place orders for new ones. Mold producers anticipate a heavy volume of new orders after the end of the strike.

The anticipated increase in pig iron prices will probably not affect mold prices, according to observers. The supply rather than the price of iron is obviously the major factor. At the calling of the truce in the coal strike, mold manufacturers tried, with some success, to scrape up supplies of coke. The difficulty with what was acquired in many instances, however, was that the coke quality was down, which is directly reflected in cupola operation costs. Mold products went far afield from their normal sources of coke supply, taking what was obtainable and frequently trucking it in.

# Weekly Gallup Polls . . .

## *Public Wants Continued Manufacture of Atom Bombs*

***Princeton, N. J.***

• • • **After nearly** ten months' discussion and controversy over control of the atomic bomb, the majority of Americans still want to see the United States continue to manufacture the bomb.

While a number of scientists and religious leaders have advocated that we should cease making these deadly and destructive weapons, that point of view is shared by less than a third of the people of the country.

The line-up of opinion on the question is shown in a poll completed by the institute on the following issue:

"Should the United States continue to manufacture the atom bomb?"

| The vote: | Pct |
|---|---|
| Yes | 61 |
| No | 30 |
| No opinion | 9 |

Veterans of World War II are more in favor of continued manufacture than the civilian population. Among veterans the vote is 72 pct in the affirmative.

Ever since the atom bomb was first revealed to the world at Hiroshima the majority of Americans have opposed giving the secret or know-how of the bomb's manufacture to other nations. Their attitude on the point has been shown in several polls conducted during the past ten months.

A rather substantial number of Americans, however, have come to believe that other countries have penetrated the secret on their own and are probably now making atom bombs.

This belief is shown in response to the following question:

"Do you think any other country is already making atom bombs?"

| The vote: | Pct |
|---|---|
| Yes | 42 |
| No | 40 |
| No opinion | 18 |

All who answered in the affirmative were asked: "What country?"

The largest number said they thought Russia is making atom bombs. England was mentioned next. A few expressed the belief that experiments in bomb making were going on in Spain or in Argentina.

The fact that about two fifths in the poll think that other countries have solved the atomic riddle may account in part for the large vote in favor of our continuing to manufacture the bombs themselves.

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• • • **Although the question** of public health insurance has been the subject of bitter controversy among medical groups and in Congress, the public's opinion as to how the program should be carried out has not crystallized very definitely as yet.

The great majority of people, a poll just completed by the institute shows, think the idea of having insurance to take care of doctor, dental, and hospital bills is a good one. But the public does not seem to have made up its mind as to how to pay for doctor, dental, and hospital expenses under such a plan.

Some suggest private, voluntary programs, others some kind of government program, such as is proposed in the Wagner-Murray-Dingell bill, while still others prefer private or community charity.

The poll likewise brings out these facts about public attitudes concerning the health program:

(1) The general public has not yet become familiar with the Wagner-Murray-Dingell medical insurance bill. Fewer than four in every ten persons polled said they had heard or read about it. As discussion about the bill continues, presumably this situation will change.

(2) The typical American family estimates that it spent about $50 last year to cover all doctor, dental, and hospital bills.

(3) The majority say they would not be willing to pay any more for medical insurance than they now pay in doctor and hospital bills, and about half say they would not be willing to pay as much. The median average of what people at this time say they would be willing to pay for a health insurance program, including doctor, dental, and hospital, is $30 a yr.

(4) Opinion is almost evenly divided on whether people would get better medical care than they are now getting if the government took over the job of administering a health insurance program.

One indication of the generally uncrystallized public opinion on the issue of health insurance can be seen from replies to the question:

"What do you think should be done, if anything, to provide for the payment of doctor, dental, and hospital bills for people in this country?"

The replies show a wide variety of ideas. A total of 17 pct suggest voluntary health insurance programs, such as the Blue Cross hospitalization plan; another group, comprising 12 pct, propose medical insurance under social security; a third group of about equal size (11 pct) suggest special grants for hospitals and clinics to care for the needy. Another group of 6 pct propose private or community charity, and 12 pct give miscellaneous suggestions. Of the remainder, 16 pct say they don't know what should be done, and 26 pct do not think anything should be done.

Other questions put to voters in the poll follow:

"Have you heard or read about the Wagner-Murray-Dingell health insurance bill which would require weekly pay deductions from every worker and employer for medical, dental and hospital insurance?"

| | Pct |
|---|---|
| Yes | 37 |
| No | 63 |

People with a college education are the best informed—66 pct said they have heard of the bill.

| | Have heard Pct | Have not Pct |
|---|---|---|
| College | 66 | 34 |
| High school | 43 | 57 |
| Grammar or no School | 26 | 74 |

[CONTINUED ON PAGE 101]

## *Stockpiling of Atom Bombs Follows Public Belief That Other Nations Have Secret*

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# Dept. of Justice to Pass On U. S. Steel Bid for Geneva Steel Works

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By KARL RANNELLS

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***Washington***

• • • **Although the WAA Price** Review Board last week announced the tentative award of the Geneva steel plant to the U. S. Steel Corp. as had been generally expected (and predicted by THE IRON AGE, May 9, 1946, p. 116), the sale has not yet been passed upon by the Anti-Trust Div., Dept. of Justice. Under the Surplus Property Act, all sales involving amounts in excess of $1 million are referred to the Justice Dept. for review.

Sealed proposals for purchase or lease of the Geneva plant, as well as for the South Chicago plant which was operated during the war by Republic Steel Corp., were opened and read on May 1. At the time, seven proposals were received for the Geneva property and two for the South Chicago plant. The board has since been analyzing the proposals and on May 24 announced the award of the $190 million Geneva property to the Steel Corp. for a cash price of $47.5 million, including an estimated $7.5 million inventory.

No action by WAA has yet been announced concerning disposal of the South Chicago plant. Officials say that it is highly improbable that a decision will be made under two weeks. Insiders generally believe that in view of Republic's bid on the South Chicago property no decision on this, as well as the Duquesne and Homestead plants, will be announced until after the Justice Dept.'s reaction on the Geneva award is known.

Wendell Berge, head of the Dept. of Justice Anti-Trust Div., told THE IRON AGE on May 24 that it would take some time to complete study of the bids. He added that although the department is allowed 90 days in which to consider the recommended award he does not expect it will require any such period to make a final decision. There was speculation as to what the reaction would be if the decision was not reached by June 15, the deadline set by the Steel Corp. for acceptance of an award.

Although Mr. Berge in the past has opposed the Steel Corp. taking over Geneva and it is an open secret that there are those within his division who would rather subsidize some other operator than let the Steel Corp. have it, he emphasized that the Dept. of Justice had not taken a position.

"The question is not free from doubt," Mr. Berge said. It will not know what it will do in the way of making recommendations until the WAA papers have been carefully studied, he reiterated.

Asked if the Dept. of Justice has the power to prevent such awards, Mr. Berge replied that such a question had never come up. He gave as his opinion that in the event of an adverse recommendation by Justice such a sale would not go through and that the prospective purchaser would not want to go through with it under such conditions.

There has also been discussion whether congressional action might be necessary to confirm the Geneva award. Mr. Berge explained that it would not require such action but that Congress naturally has a right to go into such things.

Responsible sources here, however, still doubt that the Dept. of Justice will oppose the WAA decision. Colorado congressmen have been quoted as not being "satisfied" with the award, an understandable position since business interests in that state also submitted a proposal. On the other hand, Utah statesmen are said to be heavily in favor of the Steel Corp. award because its sound financial position.

These objectives weighed heavily in favor of the WAA acceptance of the bid as well as the fact that the bid of the Steel Corp. provided the best return on the government's original investment. This was fully covered in the disposal agency's statement. It said, in part:

"It will foster the development in the west of new independent enterprise. One of the most important factors from the standpoint of consumers of steel is to have an assured source of supply. The operation of the Geneva steel plant as part of the integrated operations of U. S. Steel should tend to foster the location of steel consuming, manufacturing plants in western states.

"It will assure the most effective use of the plant for war purposes and common defense. The bid proposes to preserve for future emergencies the original facilities in good state of preservation for a period of not less than 5 yr."

TOUGH TO TAKE: *Suffering a stinging rebuff from the President and later returning in kind his ideas of the President, Alvanley Johnston, president of the Brotherhood of Locomotive Engineers, lost his battle with the government when the trainmen returned to work on the President's terms.*

# Warehouse Men Study Steel Consumer Purchase Pattern

*New York*

• • • **At the annual** meeting of the American Steel Warehouse Assn. last week Dr. Neil Carothers, dean of the School of Business Administration at Lehigh University, made some rather significant observations on the economic future of the country. While carefully hedging his remarks with the statement that no man could predict in detail and with certainty future happenings, Dr. Carothers pointed out that there were sign posts evident to him that the fluctuation of the business cycle after the war would not be likely to differ greatly from similar developments after all major wars during the past century.

He predicted that the postwar business boom would last two years, possibly a little longer. This period is expected to be followed by a violent depression characterized by a fall in prices, deflation of swollen values, and the wiping out of excessive inventories and marginal operators. Dr. Carothers predicted that this depression would be followed by a long period of prosperity.

Dr. Carothers observed that there were certain significant factors which would tend to some extent to modify the similarity between current fluctuations of the business cycle and those of the past. Among these, there are the facts that prices were held down during the war by government action, that savings have been raised to high levels by control of civilian production, and that civilian demand is higher now than after any previous war. He said that the greatest injury to the country in the current wave of strikes lay not in the strikes themselves but in the settlements resulting from them. In settling wage levels above that practicable in a competitive market, Dr. Carothers said that in the inflationary cycle in which we now find ourselves, labor would suffer more than any other class.

**A significant contribution** to the understanding of the current labor-management difficulties was made by Dr. George W. Taylor, former vice-chairman of the War Labor Board, under the heading of Management's Stake in Collective Bargaining. Dr. Taylor said that government labor policy was based on the Wagner Act, designed to assure equality of bargaining power between employees and management on the theory that such equality would prevent strikes and lockouts when groups of equal strength sat down to discuss differences across the conference table. Dr. Taylor admitted that this theory had not worked out.

In discussing the way in which labor relations should be worked out so as to overcome the present impasse, Dr. Taylor said that a policy must be developed by industry, labor and government which does not contemplate government seizure of industry. He said that labor conflict was not a subject that could be passed off on Washington officialdom, and was the result of the day by day relationship between employees and management in the plant.

**Dr. Taylor predicted** that it would not be long before the United States industrial economy returned to competitive conditions. In that connection he said that a lot of deferred obsolescence remains in industry together with a great deal of uneconomical production by marginal producers. These factors would be the first casualties of a return to a competitive economy.

Management is reported by Dr. Taylor to have fought against collective bargaining for over a century; now it is necessary for management to fight to assure collective bargaining, coupled with union responsibility in order to prevent the government from taking full control of industrial relations. In order to make collective bargaining work out, Dr. Taylor recommended the establishment of hundreds of voluntary local arbitration boards so that differences could be adjusted by local men before they developed so far as to require industrial breakdown.

According to Dr. Taylor, the public is entitled to an explanation of the reasons in each instance as to why industrial strife is necessary. He said that failure of labor and management to assume the responsibility of adjusting labor relations will result in government intervention. In answer to a question on the definition of collective bargaining, Dr. Taylor described it as a procedure for mutually working out differences in the mutual interest of employees, management and the public. Dr. Taylor said that collective bargaining was not a set of conditions or contract submitted by the union which must be subscribed to in full by management.

In answer to an inquiry as to the approach of relatively small companies such as many steel warehouses to collective bargaining, Dr. Taylor stated that it was by association of such employers into group organizations so as to meet effectively the overwhelming force of the large well-organized unions. Justifying the maintenance of membership clause in union contracts, Dr. Taylor said that in his opinion maintenance of membership was the only mechanism for the assurance of employee responsibility to a union and to the contracts worked out by the union and management. Dr. Taylor said that a serious difficulty in labor relations today was the loss of management disciplinary powers over labor during the war.

**In an historical** record of the steel industry, C. H. H. Weikel, manager of commercial research, Bethlehem Steel Co., offered an analysis of the participation of the warehouses in the distribution of steel. He said that in 1945 for the first time jobbers and distributors took the largest share of steel products, almost 17 pct of total production, 9½ million tons. Substantial increases in the warehouse distribution of steel occurred in the second half of the

year, and September's warehouse distribution reached 20 pct of steel production.

Structural shapes as a whole increased in volume during the war years and dropped off with the end of the war, but the proportion of jobbers' shape tonnage between 1929 and 1943 was 9 pct of the industry's. In 1945, jobber distribution of shapes rose to 24.4 pct.

Plates in 1943 and 1944 exceeded 13 million tons, about 20 pct of steel production. Jobber distribution of plates increased from 5.4 pct of plate production in 1929 to 10.9 pct in 1945.

The relationship of bars to total steel production has been fairly constant with a slight decline between 1929 and 1945, dropping from 20.6 pct to 18 pct of the total. The jobbers' proportion of distribution of bars has grown meanwhile from 6.7 pct in 1929 to 17.7 pct in 1945.

Sheet and strip shipments in 1929 constituted 20.4 pct of total steel production, growing to 36 pct in 1935. In 1941, sheet and strip production reached 15 million tons, about 50 pct of total steel production. During the war these products dropped in volume somewhat, but in 1945 they still totaled 13.5 million tons. According to Mr. Weikel, the proportion of sheet and strip distributed by jobbers grew from 10.1 pct of total sheet and strip production in 1929 to 15.6 pct in 1939. In 1945 it reached the peak of 17.2 pct, 2,338,000 tons.

**The pattern of the** placing of orders for steel on mills and warehouses was the subject of a talk based on an investigation made by Prof. Charles A. Livesey of the Graduate School of Business Administration at Harvard University. In this investigation it developed that for carbon steels some customers considered anything over 3000 lb a mill quantity, while others did not order from mills unless the quantity was 40,000 lb or more. In general the breaking point between mill and warehouse orders for carbon steels seemed to cluster around the figure of 6000 lb. There seemed to be some difference in the maximum warehouse size orders as between bars and sheets. Stainless and alloy maximum warehouse quantities were lower, ranging from 500 to 2000 lb. On tool steel, the maximum figure most often mentioned by consumers was 500 lb.

The investigation established the information that in normal times about half of the steel buyers queried dealt with five to seven warehouses. The balance apparently made use of 10 to 15 warehouses.

There were a good many answers to the question as to the basis on which steel buyers selected warehouse suppliers. While service rendered was mentioned in most instances, there were other factors involved such as the range of sizes handled by the warehouse and their usual inventory position, the personality of the salesman and the inside sales order personnel. Some customers indicated that their selection of a supplier was based on the fact that warehouses tend to specialize on particular type of steels or ranges of sizes and shapes. In one case the comprehensive nature of the warehouse catalog was responsible.

The importance of the mill brands of steel carried by the warehouse is apparently not a factor on orders for carbon, alloy or stainless steels, according to Professor Livesey. This, however, did not apply to tool steels.

In consideration of the fact that there is such a wide variation among buyers as to mill order quantites, it is apparent to Professor Livesey that if the billed cost of steel were the only criterion on which buyers made their decision as to where to purchase, a great deal more business would go direct to mills than is now true. There are a number of factors which have convinced purchasers of the desirability of paying the warehouse extras. Among such advantages are immediate shipments and the possibility of lower consumer inventories.

According to Professor Livesey, "Each steel buyer strikes a balance between many intangible factors favoring warehouse purchase and the lower billed cost favoring mill purchase to arrive at the dividing point for his company. Once the pattern is adopted, it becomes fixed for that buyer, and difficult to change. Thereafter, most buyers will try to accumulate requirements, if possible, or anticipate them if necessary in order to reach the quantity considered to be sufficient for a mill order.

"Before going further, let us consider the kind of fellow with whom you are dealing. If he is the purchasing officer, he has been given the responsibility for spending his company's money wisely and so as to get the greatest possible return for each dollar spent, taking into account not only the billed cost but other costs as well. Very probably he is aware of the fact that carrying inventory costs money, although just how much it costs he does not always know. He will also know whether or not his company is in a position to carry sizable steel inventories or whether working capital is more urgently needed for some other purpose.

"Also, because he is a very human sort of fellow, he probably would prefer to purchase from suppliers he knows well and would feel much more secure if the business he placed meant something to the supplier because he could then count on the supplier going out of his way to help in cases of emergency. You have then a situation in which, emotionally, many purchasing executives prefer to buy from steel warehouses and do so to a degree, justifying the added invoice cost on the grounds of savings of an intangible nature.

"But the minute you try to persuade a purchasing agent who has determined in his own mind that 4000 lb of carbon steel is the largest warehouse order he can defend, that he should raise his sights to 20.000 lb, or half a car, he immediately is confronted by a vision of extra dollars which he will be at a loss in justifying to his management when the question is ever raised. In other words, the billed cost because it is so readily apparent, may assume a weight far out of proportion to its relative importance.

"In many situations, your customers would like to increase their maximum warehouse quantities thus making for more business for warehouses as a group. However, these men are faced with the very evident fact that the billed or invoiced cost is greater and they have nothing but intangibles, difficult to support, to place on the other side of the scales.

"Having done some work with the problem of inventory management, it is more than a vague suspicion with me that many manufacturers

would be surprised if they knew the high cost of the intangibles involved in carrying sizable inventories. I believe, furthermore, that you would be doing a service, not alone to yourselves but to your customers if you attempted to show them what these costs can and do amount to.

**"Consider next** the problem suggested by the fact that your customers typically go direct to mills for much smaller quantities of stainless and alloy steels than they do in the case of carbon steels.

"Variations as between these quantities are so considerable that it suggests immediately that substantial added business would result if alloys and stainless could be handled and sold more nearly in the same way as are the carbon steels.

"Reasons for the variations given by your customers are, for the most part, those you would expect. In some instances, of course, the particular alloys they required were so special that warehouses could not afford to stock the different combinations of quality and size, and therefore your customers had to go direct to the mills to get orders filled.

"But that is not the situation at issue. The real question is why even on more common alloys that are carried by warehouse, do customers go direct to mills for seemingly small quantities.

"From talking with steel purchasers I received the impression that many times the alloy requirement was more special with the customer than it would have been with the warehouse. Buyers seemed to feel there was some additional assurance of getting the proper quality for their needs if negotiations were made directly with the producing mill. In some cases it seemed to be that advice of mill representatives was desired even though the item specified was believed by the buyer to be a semi-standard item.

"From an outsider's viewpoint the danger to warehouses that arises from this attitude on the part of customers is that there seems to be an increasing amount of so-called special purpose steel used and that in many instances it is being substituted for requirements that were formerly for more common steels purchased from warehouses.

"Purchasing officers told of several instances in which the development of new alloys or the adaptation of existing alloys to their products had taken away business from common carbon steels. If this is a trend of any proportions, it appears to an outsider that ultimately it will result in decreased warehouse sales unless warehouse operators take some action to counteract it.

"The change from one type of steel to another resulting in a customer's going directly to the mill for smaller quantities, has a compound effect, moreover, in that it will leave to warehouses smaller orders, on the average, and reduce the larger orders which are by far the most profitable to handle.

"It would appear that this change requires at least three corresponding adjustments if warehouses are to combat effectively the loss which it may bring about. First, there is a need for warehouse men to have fairly complete knowledge of new products developed by mills and knowledge also of when these products tend to become standard and thus suitable for warehouse handling.

"To the extent that steel warehouses fail to carry items for which they could develop a profitable volume, to that extent are customers forced needlessly to place reliance on mills as sources for their requirements. This in turn may cause a loss of other business as buyers attempt to consolidate their purchases.

"Second, however, it would appear that in order to attract this kind of business, steel warehouses must evidence an increased ability to give technical advice as desired by customers. Purchasing officers and others to whom I talked were somewhat mixed on the question of how helpful, from a technical standpoint, warehouse representatives could be. In many cases, of course, their requirements were so standard that there was no assistance desired.

"I did, however, obtain a definite impression that steel users look principally to sources other than steel warehouses when a problem of a technical nature is raised. In this connection, it would seem that warehouses have an opportunity to offer service of an impartial nature that would be appreciated by buyers. Being able to draw on a variety of sources for steel, warehouses, presumably, could advise more completely in the best interest of the customer.

"Third, it will probably take carefully directed sales effort to produce a sufficient volume of sales of the semi-standard steels to make it profitable to handle them on a warehouse basis.

**"The preferences** of buyers for particular warehouses, based on stocks carried, divided into fairly small product groups. One customer, for example, stated that a particular warehouse was a good source for carbon bars in small sizes and another better in larger sizes. Other customers indicated

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**STRIKE PARALYSIS:** *Dr. George W. Taylor says it is the responsibility of management and labor to bargain collectively so as to avoid government seizure of industry.*

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they had different source preferences as between bars and sheets, and as between hot-rolled and cold-finished products.

"In comparing notes on different purchases, however, it appeared that buyers' opinions were not always founded on fact because for the same items in the same locality different warehouses were sometimes preferred by different customers. Some of them must have been mistaken. Such conflicting opinions are important because they indicate that you have not done as thorough a job of selling your customers as the inventory facilities each of you has to offer would justify. They indicate that emphasis may too often have been on getting new accounts and on selling a part of a customer's needs rather than on attempting to become the steel supplier for a particular consumer. I will try to show you there is a difference.

"The result of the present method of buying and of selling is that each of you carries a large number of customers on your books compared to the tonnage you sell. How much more profitable it would be if you could sell the same tonnage to half the number of customers.

"Selling expenses probably would be reduced because there would be fewer customers to service. Delivery expenses might be curtailed by reason of fewer stops, the possibility of accumulating orders and, perhaps, a smaller territory covered. Expense of billing could also be cut down, as could the expense of indirect customer contact work by mail and catalogue.

**"Granting for the** moment, that it would be desirable to reduce the number of customers, if that could be done without sacrificing volume, the query remains of how this could be accomplished. Here, perhaps, it is possible to take counsel both from your customers and from the manner in which the warehouse distributors in other fields have approached a similar problem.

"Your customers, for example, have the impression that the more successful warehouses are those that have tried to become steel counselors to purchasers. This involves developing the personnel capable of advising customers which products will fit their special requirements, helping customers modify their products to make use of superior new steel products as they become available and assisting customers to reduce their inventories. At the same time, it will be necessary to get from your field representatives more data relating to buyers' prospective requirements so that warehouse inventories can be adjusted to these needs as they arise.

"Instead of having a purchaser look upon you as just another steel warehouse from whom he buys periodically, the emphasis should be to make each selected customer you have on your books look to you for the bulk of his requirements. In return, of course, you must be in a position to help him both with steel and with technical assistance on request."

At the meeting, Walter S. Doxsey was re-elected president; E. Jungquist, Percival Steel & Supply Co., Los Angeles, vice-president; Frank Pidgeon, Pidgeon-Thomas Iron Co., Memphis, Tenn., vice-president, and L. B. Worthington, United States Steel Supply Co., Chicago, treasurer.

In addition to these officers, the following members of the board of directors comprise the executive committee: C. H. Bradley, W. J. Holliday & Co., Indianapolis; Lester Brion, Peter A. Frasse & Co., Inc., New York; F. C. Flosi, A. M. Castle & Co., Chicago; E. D. Graff, Joseph T. Ryerson & Son, Inc., Chicago; P. O. Grammer, Grammer, Dempsey & Hudson, Inc., Newark; A. W. Herron, Jr., Jones & Laughlin Steel Corp., Pittsburgh; J. J. Hill, Jr., Hill-Chase & Co, Inc., Philadelphia; Richmond Lewis, The Charles C. Lewis, Co., Springfield, Mass.; George L. Stewart, Edgar T. Ward's Sons Co., Pittsburgh.

DOWN AND UP: *This is a picture of one of the engineers of the New York Central's express trains as he stepped down from his cab last week—climbing back up again about 48 hr later when the strike was called off.*

## Granite City Steel Down

*Granite City, Ill.*

• • • **The Granite City Steel Co.** has been shut down since Mar. 16 in a wage dispute with the International Assn. of Machinists, which established a picket line which the CIO United Steelworkers Union refused to cross. The IAM originally demanded an increase of 28½¢ an hr over the present wage scale of $1.15 an hr, which has been scaled down to 26½¢ an hr.

The union also is insisting on a continuation of the wartime practice of paying time and a half for work on Saturdays and Sundays. The company has offered an increase of 20¢ an hr, which is 1½¢ an hr over the basic wage increase granted for the steel industry, but refuses to grant time and a half for Saturday and Sunday work, because it is not that active in the industry and such payments would put the company at a disadvantage with its competitors.

## Maintains High Output

*Toronto*

• • • **Canadian Locomotive Co.,** Kingston, is maintaining operations at capacity, despite difficulties in obtaining materials, Wm. Casey, president, announced. He stated that the order for 115 locomotives for India has been completed and 30 of the 60 locomotives ordered for Belgium have been shipped. Work on the balance of the Belgium order and on 20 locomotives for the Canadian Pacific Railway and 40 for France are sufficient to keep the plant operating to capacity until early in 1947.

## The London ECONOMIST

# A National Congress?

*Reprinted by special permission to further understanding on how political and economic affairs are viewed in London.*

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"Under the rules of the Senate it is doubtful if the Bill can be brought to a vote in time to permit Congress to reach a decision on the Loan before the end of the present session."—*News Item.*

NOTHING so forcibly illustrates the United States' predominance in world politics as the fact that the procedural rules of its legislature have become a pivotal point in international relations. It is hard to conceive of anything more exclusively "domestic," better entitled to shelter behind the traditional ban on "interference in internal politics," than the methods the Congress may choose to employ for the conduct of its business. Yet in fact the reform of Congress is a more vital issue for the well-being of the world than the outcome of the mid-term elections or the personnel of the American diplomatic corps. For this reason the report recently produced by a joint Committee of the Senate and House of Representatives on the "Organization of the Congress" is a document of interest even to British readers who will never write a letter to their Congressman or come within sniffing distance of a party primary.

**The Committee** was headed by Senator La Follette, who of late years has been canalizing much of his Progressive zeal into the cause of congressional reform, and it had as Secretary George Galloway, who previously steered a committee of the American Political Science Assn. which produced a notable report on the same subject. The other members of the Committee, however, make no pretense to philosopher-kingship: they are a small but representative body of working Congressmen, by no means a collective spearhead of reform, procedural or otherwise. Indeed it is true to say that in one sense the chief interest of the report lies not in its detailed proposals, which do not greatly differ from those that students of Congress have been advocating for some time, as in the promise the report holds out of support from the rank and file of both parties.

**At the heart** of all discussion of congressional reform lies the need for making Congress think nationally and not merely locally. At the root of all difficulties in translating arguments into action lies the fact that the politics that pay —in terms of reelection and advancement—are local politics. The La Follette-Monroney Report does not contain explicit admissions of any such objectives or any such obstacle: collective conversions are not always best effected by hitching the bandwagon to a too obvious star. Congress is a patient suffering from an overwhelming frustration at the hands of an executive which it can abuse, molest, impede, but never properly control. It is to the institutional jealousy born of this that the report most overtly addresses itself; it is in terms of "strengthening the legislative arm" and "playing a larger part in determining national policy" that its proposals are advanced. But although this results in the admixture of a certain amount of Congressman's dross with the political theorists' gold (or should the materials be reversed?) the fact remains that if adopted in toto the recommendations would result in a Congress capable of functioning as a truly national legislature for purposes both domestic and foreign.

ALL critics of Congress begin with the committee system. The report unhesitatingly recommends sweeping reorganizations here. It would cut down Senate committees from the present 33 to 16 and those of the House from 48 to 18. (Connoisseurs of congressional xenophobia need not be alarmed: the continuity and identity of the Committee on Un-American Activities are carefully maintained.) The cuts are effected by consolidating obviously related committees, by turning the time-consuming private claims over to the courts and by conferring on the District of Columbia the long-delayed right of self-government. This should produce a great reduction in overlapping jurisdictions, wasted manpower and diffused responsibility. A corollary to the regrouping of the professionals is a disbandment of the guerrillas, and it is proposed to substitute for the traditional harassment by special investigating committees a "continuing review and oversight of legislation and agencies" by the appropriate standing committees. These, in turn, have to be made responsive to the whole of which they are only a part, and some of the most ingenious details of the report are those aimed at preventing committees holding up or mauling legislation entrusted to them.

**The keystone to this** improved arch of committee organization would properly be a committee of committees, or legislative cabinet, which would consist of the chairmen of each committee reporting and consulting on the relationship of parts to the whole. The report stops short of this, but it does recommend formal committees of both chambers "for the determination and expression of majority policy and minority policy." The majority committees in turn are to serve as "a formal council to meet regularly with the Executive." This would regularize, probably advantageously, relations between Capitol Hill and White House.

At this point the ugly chad of sectionalism pops its head over the wall of national unity and asks, "Wot? No Southern chairmanships?" At various points in a remarkably unanimous report, Mr. Cox, of Georgia, "regrets that he is unable to join in this recommen-

[CONTINUED ON PAGE 101]

WALTER S. TOWER *was reelected president of the American Iron & Steel Institute at its annual meeting at the Waldorf-Astoria May 23. Other officers re-elected were: B. F. Fairless and Frank Purnell, vice-presidents; Harold L. Hughes, treasurer and George S. Rose, secretary.*

## *New York*

• • • **With the steel industry** threatened with a complete shutdown because of the rail and coal strike, representatives of the nation's steel firms met in New York last week to talk over their mutual problems—which were many. Steel ingot output, which after VJ-Day, reached 89 pct capacity, was intermittedly affected by the outlawed coal strike last October, the steel strike in January and the current coal mine stoppage to the point where output had dropped below 49 pct of capacity.

Commenting on the steel industry's part in the reconversion, Walter S. Tower, who was re-elected president of the American Iron & Steel Institute, said:

"Given a respite from work stoppages and strikes, the iron and steel industry can quickly solve the problem of supplying large quantities of its products for civilian consumption, but it cannot play its full part in restoring this nation to a sound economy and continued progress until it regains the right to manage its affairs.

"Your industry was able to make its contribution to victory in war," he said, "because over the years of peace it had the privilege of making modest profits. It was able to accumulate some of its own funds for expansion and technical progress. It could attract additional capital from investors who had reasonable expectation of some return on their investment.

"Anyone who thinks that OPA is primarily concerned with price ceilings as a check on inflation does not read the signs correctly. Its real concern is profit control, holding stubbornly to a base which, almost from the outset has been wholly unrelated to current costs or volume.

"At least for the present, industry has lost the verdict in respect to sound policy on wages and prices. Against good judgment, you have just been forced to give the largest wage increase in the history of the industry. In magnitude it was contrary to every consideration of the national welfare. It had to be coupled with one of the broadest price advances ever attempted. Even that advance was not enough, for a cloud of doubt hangs over the field of future profits. Already there are hints that labor will presently come back with new demands. When that happens the answer again will be difficult, for controls will still be upon you.

"The only sound policy of price control is that policy which not only will permit but actually will encourage the production of all needed goods. That—we have not had. Instead, the guiding principle in price control has been limiting profits, blindly ignoring the effects of price on production and supply. There is only one way to escape from those economic shackles which restrain production, destroy long-used channels of distribution, undermine industrial strength, and imperil the very existence of many companies. That way is to admit that the war is over; to cease substituting politics and social theory for business judgment; to terminate controls and let productive abilities operate freely," Mr. Tower said.

According to Leo Wolman more peaceful labor relations in American industry will be achieved when the conditions essential to peace are created, not by the establishment of new machinery or by passing a succession of new laws. "Labor troubles" he said, "are due not to specific provisions of statutes, but to the underlying philosophy and policy of labor relations. Until that essential fact is grasped we shall remain confused and impotent and, whatever is done through patching up existing laws will only yield temporary breathing spells and cause more labor crises in the not too distant future.

"We were brought to our present state by a succession of national labor policies, conceived within the last 10 yr and enforced with extraordinary effectiveness by all the arms of the federal government. The essence of these policies is that the federal government undertook to assist organized labor in unionizing the employees of this country. After 10 yr no one can question the potency of this partnership between government and labor.

"The conditions our federal policies and administration have produced can be remedied only by fundamental reforms. It is time to hold unions, like everybody else, responsible for their illegal acts. If it is wrong and against the public interest for individuals and companies to obstruct trade and commerce through conspiracy, then it is wrong and against the public interest for unions to do the same things for the same purpose. It is time to hold unions, like everybody else, responsible for acts of force and violence, which violate the rights of individuals and communities.

"Above all, it is time that the agents of government are made amenable to law. They are employees, not of the labor movement but of the people of the United States. They were appointed to public office, not to become union organizers, or to further the interests of any special group, but to interpret and enforce the law with impartiality and to concede equality before the law to all American citizens.

"These are the reforms we urgently need to pave the way for more

# *AISI Covers Troublesome Problems*

# While Steel Industry Is Paralyzed

peace in industry. We require, not a series of punitive statutes, but a public policy and underlying legislation which clearly define rights and duties, cease playing favorites with the instrumentalities of government, and assure every litigant a fair hearing and an impartial adjudication of his grievances."

Striking at the whole theory that government can fix prices and profits to the benefit of anyone, Enders M. Voorhees, chairman of the finance committee, United States Steel Corp., called for a return to the free competitive system in which such price and profit factors are governed by the customer. Mr. Voorhees spoke before the 54th General Meeting of the American Iron & Steel Institute.

"All government efforts to fix reasonable profits or to determine prices by profits or profits by prices," he said, "are unalterably opposed to the American fundamental that producers must compete while competing customers—the public—decide. All such government efforts are either open or disguised measures to protect the customer from himself. Actually the customer never needs protection—except in that ancient and continuing struggle to escape frustration and exploitation by government under the guise of protecting him."

The steel industry, he said, has in prospect a period of high production, but he doubted if its earnings would bring a satisfactory return.

"I believe that under existing conditions few or maybe none of us will have a sustaining return upon the more than five billion dollars of tools that represent the steel industry's assets and which we could use for an all-out production," Mr. Voorhees declared. "But while we are shifting back into production of peacetime products we are not yet shifting back into competitive business. It can scarcely be said that during the war years we were really in business. We were just producing iron and steel according to directions.

"We have, as an industry, been operating between rigidly controlled prices and uncontrolled costs. The heavy wage increases have only partially seeped through to what we buy—but eventually they will be felt in full. We can look forward to rising costs."

A buyer's strike, Mr. Voorhees asserted, may come about through government encouragement of abnormal wage advances requiring price advances to cover them.

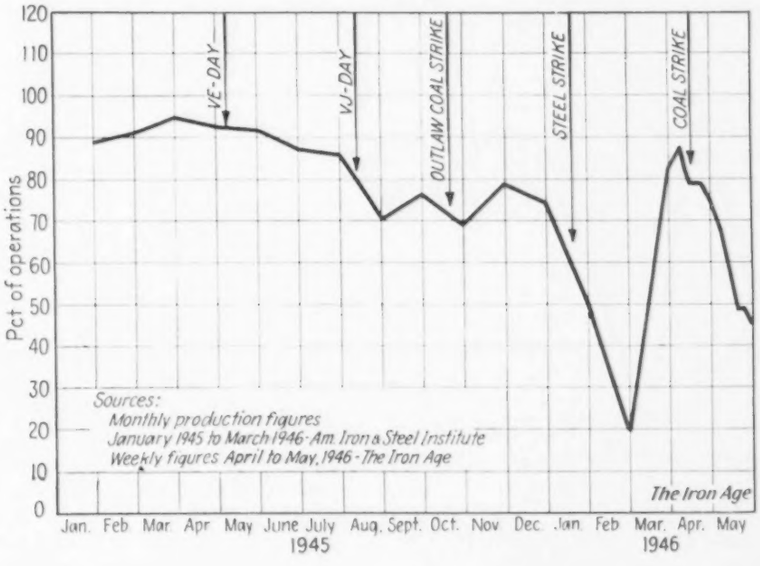
"The first abnormal wage and price rises start waves of other increases and these come back at us in a higher price for the things we buy. You can see it coming today in coal, ore and freight and thousands of other items. All these combine to require further price increases. And then, where are we? We are on our way to the final squeeze by the customer—for the customer always has his own ceiling price. And we shall stay squeezed by King Customer until we adjust ourselves downward or the customer adjusts himself upward, neither of which can come about unless price and wage fixing be abandoned."

For the next few years, the steel industry can expect annual demands calling for approximately 80,000,000 tons of ingots, following closely the prewar pattern of distribution as to commodities with substantial increases in the lighter products, said Quincy Bent, vice-president, Bethlehem Steel Co., in a 15-min talk before the general meeting of the American Iron & Steel Institute in New York.

"If our objectives be quantity, quality and costs, then we must

LEO WOLMAN, *Columbia University professor who analyzed labor problems for steelmen at their annual meeting at New York May 23.*

**LOST FOR GOOD:** ***Strikes since the first of this year will have cost the steel industry more than 13,000,000 tons of ingots before matters are straightened out and operations are on their way again. The dip after VJ-Day was much smaller and of less duration than industrial officials had expected, but the optimism was short-lived as the chart indicates.***



come more and more towards standardization in manufacturing processes and methods," said Mr. Bent. "This should be for the benefit of both producer and consumer.

"Of all of our problems in the post war era, I would stress first the importance of quality as reflected in the service of the steel for the designated purpose; without which we will have no customers, or at the best, dissatisfied ones. And, then the most economical production of our steel commodities.

"Some of the most obvious approaches toward this maximum economy are:

Selective use of properly prepared materials and the avoidance of waste.

Effective recovery and use of all byproducts.

Overall economy of large tonnage units.

Minimum of manhours required to produce a ton of shipped product, accomplished by improved facilities, better processes and more efficient labor.

Maximum yield of acceptable products from the ingot.

The savings in repairs and maintenance and the consequent idle time of productive units when under repairs.

"A reduction in cost of only 50¢ per ton may be but 1 pct of the selling price of steel, but in the volume of business it will have a marked effect upon our balance sheet.

"And finally, two results of the war period have brought before us strong emphasis on the possibilities of research and the opportunities for new and increasing uses of steel. These are considerations not only for a single company of our industry but stand as a challenge to our collective thought and ingenuity to make more steel, of better quality at a lower ultimate cost to the consumer than any other competitive material."

Drastic changes are needed in the administration of the Office of Price Administration, if the OPA is to survive, said Walter E. Watson, vice-president, Youngstown Sheet & Tube Co., in a 15-min talk before the general meeting of the American Iron & Steel Institute in New York.

"The powers of the OPA Administrator must be specifically defined and limited," said Mr. Watson, expressing the hope that the agency "will lean more in the direction of sound business sense, which is, that to continue in business, industry must make profits and the shareholders' interests must not be entirely forgotten."

"Unfortunately OPA officials make all of the rules, and they consistently ignore all arguments having to do with changes in product mix, reduced operations, or possibilities of high wage and materials costs. They do not look forward, but hold to the principle of looking at costs already established, and do not consider estimates of increasing costs bound to occur. They do prophesy future costs, usually downward, because of future conditions as they appear to them, and in arriving at conclusions, they always find some new factor that will cloud the issue and delay the answer."

## *Automotive Pioneers Join Hall of Fame At Industry Convention*

*Detroit*

• • • **Ten pioneer** automotive manufacturers, two pioneer automobile dealers and two production workers were included in the Automotive Hall of Fame selected by the National Automotive Golden Jubilee committee. These men will be honored at a dinner at Detroit's Masonic Temple on May 31, after which a dramatized tribute was paid them for their contribution to the progress of the automobile industry.

The list of outstanding motor industry pioneers follows:

Edgar L. Apperson, Phoenix, Ariz., pioneer automobile builder and designer, who was responsible for many early mechanical advances;

William Crapo Durant, New York, automotive empire builder and founder of General Motors Corp.;

J. Frank Duryea, Madison, Conn., surviving member of Duryea Bros.;

Henry Ford, Dearborn (Mich.) father of the assembly line, who drove his first car in Detroit, June 4, 1896;

George Holley, Detroit carburetor manufacturer who has been selected by auto parts manufacturers as an outstanding pioneer of their branch of the industry;

Charles B. King, Larchmont, N. Y., who built and drove the first car in Detroit on Mar. 6, 1896;

Frank Kwilinski, South Bend, Ind., who has just completed 60 yr of continuous service with Studebaker Corp.;

Charles W. Nash, Beverly Hills, Cal., who headed some of the industry's largest companies;

Barney Oldfield, Los Angeles, whose name has long been synonymous with speed;

Ransom E. Olds, Lansing, (Mich.) who pioneered the volume production of automobiles;

Alfred P. Sloan, Jr., New York City, pioneer manufacturer of motor parts;

Charles S. Snyder, York, Pa., veteran Hudson and White dealer;

John Van Benschoten, Poughkeepsie, N. Y., pioneer Dodge and Plymouth dealer;

John Zaugg, Cleveland, who has been with the White Motor Co. continuously for 51 yr.

The naming of these men completes the roster of the Automotive Hall of Fame.

## *Raises Soil Pipe Prices*

*Washington*

• • • **Resulting from** recent materials and wage increases, the OPA has granted manufacturers an increase of 4½ pct in prices for cast iron soil pipe and fittings, effective May 23. Jobbers were permitted to add the same percentage increase to their prices but OPA said that retail ceilings will not be affected. This was the second increase granted in six months and brings soil pipe prices to a level approximately 35 pct above March 1942, prices.

The sale of extension pieces 8-in. long or longer must now be at the ceiling prices established for pipe. The sale of such lengths as fittings is prohibited. OPA said that this action was taken at the suggestion of the Industry Advisory Committee.

## Weekly Gallup Polls

[CONTINUED FROM PAGE 91]

"Just making a guess, about how much did you pay for doctor, hospital and dental bills during the past year?"

| | Pct |
|---|---|
| Nothing | 16 |
| Under $25 | 21 |
| $25 to $50 | 16 |
| $50 to $100 | 16 |
| Over $100 | 28 |
| Don't know | 3 |
| Median average | $50 |

"How much would you be willing to pay a year for you and your dependents to join a health insurance plan which would pay all doctor, hospital and dental bills?"

| | Pct |
|---|---|
| Nothing | 9 |
| Under $25 | 30 |
| $25 to $50 | 23 |
| $50 to $100 | 15 |
| Over $100 | 4 |
| Don't know | 19 |
| Median average | $30 |

"If the government handled a health insurance program do you think you would get better medical care or not as good medical care as you are now getting?"

| | Pct |
|---|---|
| Better | 32 |
| Same | 23 |
| Not as good | 35 |
| No opinion | 10 |

## The London Economist

[CONTINUED FROM PAGE 97]

dation." Mr. Cox is the voice of the Southern Congressman, who under the seniority rule is able to occupy all the major chairmanships whenever there is a Democratic majority. Significantly, there was a "lack of agreement" among the reformers on ending the seniority rule; significantly, Mr. Cox opposes the reduction in the number of house committees; significantly, Mr. Cox wants no formal policy committees. It is easy to see why: each recommendation is a gulf stream melting the icebergs of Southern minority control.

INDEED, all Congressmen like chairmanships, though not all have a Southerner's expectation of them. To atone for its cuts, the committee recommends some offsetting perquisites—an $8000-a-yr "high caliber administrative assistant" for every Congressman, a "stenographic pool" to ease the strain on Congressmen's clerical staff; a rise in salary to $15,000 a year with a tax allowance for "duplicated rents" at Washington and at home. These should make the labors of office more tolerable, and Mr. Dalton's £1000-a-year, secretaryless colleagues in the House of Commons will eye them with envy. But the real Congressional problem is that of making electoral defeat less penalizing, and political courage less costly. Here nothing would be so beneficial as the revision of the "Locality Rule"—the convention (for it is no more) that every Congressman must be a resident of the district he represents. But the committee's terms of reference stopped short of that.

**Perhaps the most** revolutionary of the recommendations are those concerning fiscal control, which makes a serious attempt to end the detailed itemization of appropriations, the log-rolling and the legislation-by-rider which are the present curse of appropriation bills, and to insist on Congressional bookkeeping which will bring revenue and expenditure within the framework of an annual budget. This involves a considerable overhaul of the existing Appropriations Committees, and it will be surprising if these réduits of Senate and House do not offer tough resistance. The lobbyists, too, will eye such reform askance; the committee's proposal to compel lobbyists to "register" is little more than an invitation to the big, bad wolves to show what big teeth they have, rather than to have them drawn.

**It is easy to criticize** the report for its omissions: many of them—such as the House Concurrent Resolution which forbade discussion of the Senate's practice of unlimited debate—proceed from its restricted terms of reference. But all schemes for congressional reform rest ultimately on the ability of House and Senate to pull themselves up by their own bootstraps, and the difficulties of such constitutional levitation are so great that experience suggests the strong advisability of not attempting too much at a time. The value of the La Follette-Monroney Report is not in the abstract excellence of its recommendations, but in its skill in getting the maximum combination of the ideal and the practicable. If it is adopted, the work of Congress will be both lightened and improved; the country, the Congressmen and the President will all be the gainers. It may be, however, that local and sectional interests will prove too strong and that the old American preference for governing the country the hard way will win the day. If so, it will not only be loans to Britain that will suffer: the prestige and power of representative institutions all over the world will share in Congress's decline.

## OPA Allows Price Rise On Cast Iron Boilers

*Washington*

• • • **Both manufacturer** and user prices for cast iron boilers, boiler jackets and repair parts will go up on the average about 15 pct and user prices for cast iron radiators 4 pct effective May 21, as a result of wage-price increases granted by OPA on May 20.

Resellers of the boilers and repair parts are permitted to increase their existing ceiling prices by the full percentage amount of the manufacturer increase, but on radiators, dealers are held to a dollar and cent pass-through, OPA said. Additional dealer absorption is considered impossible under the earnings standard, the agency said.

Manufacturers are given some additional relief by permitting them hereafter to pass on certain transportation charges. Since March 1942 manufacturers have been paying all freight costs on shipments of 200 lb or more. From now on they need pay only the first 60 per cwt, and buyers will pay the rest, if any. Buyers have always paid full freight on smaller shipments, and will continue to do so, OPA said.

The latest manufacturer increases, together with others previously allowed, aggregate 41 pct over October 1941 prices in the case of radiation, and 27½ pct in the case of boilers and parts, OPA estimated.

## Culvert Prices Advanced

*Washington*

• • • **Affecting both** manufacturers and resellers, prices for corrugated metal culverts were increased 7 pct by OPA over the March 1942 levels, effective May 24. OPA said that the increase was largely due to increased steel prices and to wage increases allowed by culvert manufacturers.

# Industrial Briefs . . .

° GEAR ENGINEER—Charles G. Pfeffer has announced the opening of offices at 475 Fifth Ave., New York 17, as consulting gear engineer. He has specialized in gear design and gear production for many years in association with the aircraft engine and machine tool industry and has published numerous articles on this subject.

• NEW FABRICATING FIRM—The Ferro Fabricating Co., Inc., has been organized at Birmingham to produce light structural steel and ornamental iron products. Officers are Clement S. Walter, Jr., president; Charles S. Caldwell, Jr., vice-president and treasurer, and Charles E. Denman, secretary and general sales manager. The plant is located at 3333 27th Ave., North.

• PRODUCTION SCHEDULED—Production of farm and home refrigeration equipment has been scheduled by International Harvester Co. to start July 1 at the former Republic Aviation Corp. plant near Evansville, Ind., which Harvester recently acquired.

• NEW DEPARTMENT—Sam Tour & Co., Inc., New York, has announced the addition of a department of mechanical engineering. E. V. Crane, former consultant and chief of development engineering to E. W. Bliss Co., is heading up the new department.

• CHANGE OF ADDRESS—Freedom-Valvoline Oil Co. has moved from 431 Main St., Cincinnati to Freedom, Pa.

• RESEARCH DIRECTOR—A. Fogg has been appointed director of research of the British Motor Industry Research Assn. During the war he was connected with development of the gas turbine and has contributed to a solution of the bearing and lubrication problems.

• SWISS AFFILIATE — Brown Boveri Corp., a new company, has been formed under the laws of the State of New York, as an affiliate of Brown, Boveri & Co., Ltd. of Baden, Switzerland. The company will endeavor to cultivate the friendly ties existing between engineers in this country who know Brown Boveri equipment and the organization responsible for these designs and developments.

• OPENS WAREHOUSE—The Carpenter Steel Co. of Reading, Pa., has opened a warehouse to handle stainless and tool steels at 1390 Michigan Ave., Buffalo. Charles H. Harton, formerly assistant district sales manager of Indianapolis, has been named sales manager in charge of the Buffalo district.

• HEADS PROGRAM — Milton Lennard, vice-president and general manager of the National Magnesium Corp. of Elkton, Md., and New York, has been placed in charge of the company's $2,000,000 expansion program for the fabrication of magnesium alloys.

• NEW ROLLING MILL — Canadian Tube & Steel Products Co., subsidiary of Dominion Steel & Coal Co., Sydney, N. S., has announced plans for the construction of a rolling mill in Montreal to produce bars for the Quebec and Ontario markets. The proposed new unit will cost approximately $2,000,000. Steel for the mill will be supplied by the Sydney plant.

• OPENS NEW PLANT—Wendt-Sonis Co., manufacturer of carbide cutting tools at Hannibal, Mo., has opened a new manufacturing plant and warehouse at 580 N. Prairie Ave., Hawthorne, Calif. The new plant, which is now in production, includes complete design and engineering facilities for the production of special tools.

## AISE Plans Convention And Technical Program

*Pittsburgh*

• • • **The Iron and Steel** Exposition, sponsored by the Assn. of Iron & Steel Engineers, will be held in the Cleveland Public Auditorium, Cleveland, on Oct. 1, 2, 3 and 4, 1946. The exposition, which is held in conjunction with the annual convention of the AISE, will feature exhibits of over 150 manufacturers supplying equipment and services to the nation's iron and steel, metalworking, and allied industries. The arena and exhibit hall of the Cleveland Auditorium will be utilized for the housing of the exhibits. An attendance of over 12,000 engineering, operating, and supervisory personnel from the iron and steel, metalworking, and allied industries is anticipated.

Technical papers on various phases of plant operation and practice will feature the annual convention. These papers will be prepared and presented by authorities on engineering and operation from both metal producing firms and the equipment supplying firms.

## Chinese Engineers Meet

*New York*

• • • **Chinese Institute** of Engineers, America section, will hold its 1946 annual convention on June 29 through July 1 in New York at the Hotel New Yorker. This will be the third convention of C.I.E., America section, since its revival in the year 1942. The membership of the section has now exceeded 1000 scattered all over the United States.

The program of the convention consists mainly of business meeting, technical sessions, plant visits and banquet. During the technical sessions, there will be talks given by leading Chinese and American engineers who have just returned from technical missions in Taiwan and other parts of China. Group visits of industrial and utility stations will be conducted in and around New York.

Dr. P. H. Chang, new Chinese Consul-General in New York and official spokesman of the Chinese Government in Chungking during the war years, will be the main speaker on Monday evening, July 1.

# Construction Steel...

*New York*

• • • **The estimated total** bookings of fabricated structural steel for the month of April, 1946, according to reports received by the American Institute of Steel Construction amounted to 115,987 tons, an increase of 5 pct over the average April bookings for the five prewar years 1936-40.

April shipments, amounting to 110,420 tons, were the highest for this year, but were 10 pct less than the five prewar year average for the same month. The tonnage available for future fabrication on Apr. 30 increased to 673,979 tons.

Following is the complete tabulation of bookings and shipments:

| | Estimated Total Tonnage for the Entire Industry 1946 | Estimated Total Tonnage for the Entire Industry Avg. 1936-40 |
|---|---|---|
| Contracts Closed | | |
| January .... | 235,817* | 107,578 |
| February ... | 132,707* | 96,280 |
| March ..... | 173,871* | 124,558 |
| April ..... | 115,987 | 110,783 |
| Total .... | 658,382 | 439,199 |
| Shipments | | |
| January ... | 107,490* | 92,578 |
| February ... | 63,803* | 88,626 |
| March ..... | 102,803* | 115,031 |
| April ..... | 110,420 | 123,650 |
| Total ..... | 384,516 | 419,885 |
| Tonnage available for fabrication within the next four months | 673,979 | 319,163 |

*Revised

• • • **Fabricated steel awards** this week included the following:

**1400 Tons,** Caddoa, Colo., tainter gates, John Martin Dam through Morrison, Knudsen, Inc., to American Bridge Co., Pittsburgh.

**800 Tons,** Los Angeles, U. S. Gypsum Co., plant, to Kansas City Structural Steel Co.

**600 Tons,** New York, research laboratory, Geo. A. Fuller Co., to American Bridge Co., Pittsburgh.

**477 Tons,** Los Angeles, Mission Appliance Corp. warehouse, to Bethlehem Pacific Coast Steel Corp., San Francisco.

**475 Tons,** Buffalo, N. Y., plant and office building, Hinde & Dausch Paper Co., to Pittsburgh-Des Moines Steel Co., Pittsburgh, through H. F. Stimm, Inc., general contractors.

**400 Tons,** Vandergrift, Pa., alteration and addition to buildings, Carnegie-Illinois Steel Corp., to American Bridge Co., Pittsburgh.

**300 Tons,** Buffalo, N. Y., addition to Brost Motors, Inc., to Buffalo Structural Steel Corp. through Siegfried Construction Co.

**250 Tons,** Columbia Falls, Mont., Hungry Horse Dam warehouse, U. S. Bureau of Reclamation, to American Bridge Co., Pittsburgh.

**200 Tons,** Rankin, Pa., trestle repairs, Carnegie-Illinois Steel Corp., to American Bridge Co., Pittsburgh.

**200 Tons,** Minneapolis, Minneapolis-Honeywell Regulator Co., building, to American Bridge Co.

**180 Tons,** Buffalo, N. Y., addition to R. P. Adams Co., Inc., to Bethlehem Steel Co., through H. F. Stimm, Inc., general contractors.

**150 Tons,** East Aurora, N. Y., new building for Fisher-Price Toy Co., to Buffalo Structural Steel Corp., through Siegfried Construction Co., Buffalo.

**150 Tons,** Ainsworth, Iowa, bridge, to American Bridge Co.

**150 Tons,** Vincennes, Ind., repairs bridge 189/34, Baltimore & Ohio RR., to American Bridge Co., Pittsburgh.

**135 Tons,** Parsons, Kan., bridge 557.5 and repairs, Missouri, Kansas & Texas R. R., to American Bridge Co., Pittsburgh.

• • • **Fabricated steel inquiries** this week included the following:

**2500 Tons,** Redondo, Calif., Southern California Edison Co., steam generating plant.

**2400 Tons,** Fort Peck, Mont., power house.

**1000 Tons,** Pensacola, Fla., paper mill.

**1000 Tons,** Lincoln, Ill., manufacturing building; B-W Construction Co., Chicago, contractor.

**900 Tons,** Milwaukee, Heil Co., plant.

**650 Tons,** Louise, Ariz., Davis Dam spillway gate; bids to U. S. Bureau of Reclamation.

**600 Tons,** various locations, Santa Fe RR., bridges.

**550 Tons,** Lansing, Iowa, Interstate Power Co., power station.

**455 Tons,** Chicago, Armstrong Bros. Tool Co., factory building.

**400 Tons,** Tacoma, Wash., six bridges; bids to U. S. Engineer.

**350 Tons,** Eliot, Calif., Pacific Coast Aggregates, Inc., plant.

**300 Tons,** LaPorte, Ind., Allis-Chalmers Mfg. Co., buildings 78 and 82.

**100 Tons,** Los Angeles, transmission towers, Bureau of Power & Light.

• • • **Reinforcing bar** inquiries this week included the following:

**1175 Tons,** Odair, Wash., miscellaneous bars, Bureau of Reclamation, Denver. Schedules 2 and 3, Inv. A-20,457-A, bids open May 28.

**125 Tons,** Marion Co., Ore., bridge, North Santiam highway, Willamette National Forest, Public Roads Administration, Portland, bids to open June 4.

**100 Tons,** Coram, Calif., miscellaneous bars, Bureau of Reclamation, Denver. Schedule 1. Inv., A-20,457-A, bids open May 28.

• • • **Plate inquiries** this week included the following:

**3300 Tons,** Loveland, Colo., penstocks, U. S. Bureau of Reclamation specifications .1347; bids due June 24.

**2000 Tons,** State of Washington, tunnel lining, Winston Bros., contractor.

## *Vickers-Armstrongs Reports New Orders Reach $198 Million*

*London*

• • • **Vickers-Armstrongs, Ltd.,** up to the end of March this year have booked orders for merchant ships valued approximately at $72,000,000, for commercial aircraft $24,000,000, and for engineering products $22,000,000. This information was disclosed by the chairman of the company, A. A. Jamieson, in his speech at the annual general meeting held recently in London. An additional $80,000,000 contract has been taken for A.I.R.O.H. prefabricated houses, and every effort is being made to find suitable employment for the engineering capacity which has become available through reduced armament production. It seems probable that the firm's armament business will in the immediate future concentrate more on design and development rather than production.

Plans for improvements and modernization amounting to $28 000,000 have been authorized by the directors, some of which are already underway, and they are negotiating purchasing the South Marston aircraft works and airfield and have agreed to buy the Brooklands properties. The main engineering works and shipyards of Vickers-Armstrongs will be located at Barrow on the Tyne, comprising Elswick, Scotswood, and the naval yard, as well as the subsidiary company known as Palmers, and the southern group comprising Crayford, Dartford and Weymouth.

The reconstruction period has given the English Steel Corp. Ltd., an opportunity to overtake to some extent the maintenance arrears which have accumulated during the war, and to start modernizing the machinery in line with the most up-to-date practice. The expenditure program for the corporation and its subsidiaries during the next five years will most likely exceed $16,000,000. Firth-Vickers Stainless Steels, Ltd., in which the English Steel Corp. has a 50 pct interest, has had similar difficulties, but these are being overcome and the order book for commercial requirements of stainless and heat-resisting steels is now at a satisfactory level.

Palmers Hebburn Co. Ltd., effectively contributed to the war effort by repairing, converting and refitting warships and merchant vessels and structural steelwork of all types, while Cooke, Troughton & Simms, Ltd., have taken substantial orders for all of the various types of commercial instruments produced. The Metropolitan-Cammell Carriage & Wagon Co. Ltd., has received large contracts for railway freight and passenger cars, 60 pct of which is for export, and considerable bus body orders are being carried out.

# MACHINE TOOLS

. . . News and Market Activities

## Foreign Orders Lend Strength to Market

• • • **Gaining strength** from foreign inquiries and orders, and a sporadic spread of domestic business, the machine tool market shows only limited symptoms to the limp it is expected to develop as a residual effect of the paralysis now gripping industry generally.

New business continues strong with some segments of the industry in Cincinnati, with some builders indicating that approximately 60 pct of all new business is from foreign customers, and all builders acknowledging that a "very important" portion of their new business stems from overseas sources. Standard milling and grinding machines, planers and boring mills of all sizes are on the books for France, Belgium, Switzerland, Holland, Sweden, Finland and Greece, while Turkey, though apparently having some financial difficulties, is placing an order now and then for single machines. According to one producer, business from South America continues to run between $25,000 and $50,000 a month.

Some sources allege that the general business disturbance in the wake of labor difficulties in supplying industries has made many potential buyers hesitant. Prices are another source of concern to many producers. With foundries reporting the need for higher prices and the wage increase to electrical workers meaning higher costs in these quarters, machine tool manufacturers whose own plant costs are going up, are discussing the possibilities of further relief.

In the Detroit area, machine tool order volume is holding up very well despite limitations in deliveries imposed by shortages of castings, steel plates, electrical controls and motors. In a number of recent installations, rebuilt motors carrying guarantees have been used.

**Paralleling the** situation in Cincinnati, foreign business accounts for a substantial part of the total in Detroit. According to some observers, there is no indication that trade barriers or exchange difficulties are interfering with this market and the current healthy demand is expected to continue for some time to come.

The amount of surplus equipment available in the Detroit area has hardly been scratched, sources in the trade report, and there are indications that the automobile manufacturers are currently buying a substantial volume of standard equipment even though the trend is in the direction of specialized and sometimes fully automatic equipment. The recent price rise in machine tools has apparently enhanced somewhat the attractiveness of the government - owned surplus, but there is no proof that new tool buying is being seriously curtailed by recent price increases.

Boston market trends show slack business, with many dealers in used tools displaying little incentive to increase floor stocks, and the trade in general gaining only consolation from the fact that the supplies of the most desirable tools in the surplus are being slowly whittled down.

Builders in the Boston area are closely watching inventories, and plant operations have been cut from 48 to 40 hr a week in many cases. Vacations and "long weekends" are being suggested and some observers take these to be signs of the times and indications of what is to come. Such curtailment is not general, but it is gaining momentum.

While customers have not complained by and large over the recent price advances, sales of new tools are not coming through in any satisfactory volume. Prospects are keeping their orders in abeyance, and in some instances requesting makers' representatives to get the items desired out of the surplus. This unhappy state of affairs is engendered by the fact that there is plenty of equipment reported as surplus by the government eight months ago that is still in operation in former war plants.

**In the New York area,** tool manufacturers discounted the railroad strike as merely a short delay in manufacturing operations, and were apparently in position to maintain production despite the recent tie-up in delivery of raw materials.

Machine tool order backlogs are currently estimated at more than a year, in some cases, and growing by about 20 pct per month. Certain types of tools, however, are available on short-term delivery—six weeks or a little more. These include radial and upright drills, small milling machines, small grinders, shapers of 16 to 20 in. capacity, and equipment such as punch presses, and shears from small manufacturers.

Many dealers are not taking foreign orders for tools, but forwarding them to the builders, indicative of the dubious financial status of many potential foreign customers. At the same time, there is a certain lack of interest on the part of tool dealers in selling WAA surplus tools at the present time. One dealer reports that since the origin of his dealership in January, WAA has not paid a single commission on sales. This, coupled with the difficulty of finding and freeing the desired equipment in WAA inventory, has cooled off the dealers considerably.

**In Cleveland,** some segments of the industry report that while orders fell off 50 pct in Febuary as a result of the steel strike, May has been a good month despite John L. Lewis' peregrinations in collective bargaining. Few cancellations have been reported, and it is not likely that the rather routine situation which prevails at this time will be materially changed until the industrial horizon clears and the full effect of the coal strike on steel supply can be generally evaluated.

Recurrent and fantastic stories continue to attend WAA operations here, posing a completely bolixed situation which could possibly result in many machine tool builders and long-established dealers calling quits with the agency. It is generally agreed that more than a change in WAA administration is needed. The completely political aura which surrounds surplus machine tool disposal is long overdue for an airing.

# NONFERROUS METALS

**. . . News and Market Activities**

## Wage Approval Aids Price Rise Action

*New York*

• • • **Now that the Wage** Stabilization Board has approved the wage agreements based on 18½¢ per hr for copper, lead and zinc mines and refineries in the 11 Rocky Mountain states and Alaska and including those producers in the recent government fact finding board award, there is a good possibility of early action on price increases for these metals. The OPA has been studying requests from producers for some time it is understood but has been unable to take constructive action pending WSB approval. The approved wage rate may now be used as the basis for the application for increased prices on these metals and their by-products.

The Office of Metals Reserve is not in a position to purchase any more nonferrous metals from abroad after June 30 when its authority under the War Powers Act expires by reason of the unwillingness of Congress to extend the period of the Act. Therefore there is no likelihood of the building of stockpiles or the purchase at a loss to the government of supplies for current needs. This situation is said to be such as to require the earliest action by the OPA so as to permit U. S. industry to compete for supplies with foreign markets.

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## Lead Shortage to Continue

*New York*

• • • **At the meeting** of the CPA industry advisory committee for lead last week, there were 6000 tons available for allocation to meet requests for 60,000 tons. It was impossible to meet these requirements even by adhering carefully to the stringent restrictions of the revised lead order and so it was necessary for committee members to select only the more essential needs for their recommendations.

In the opinion of lead producers the only way to meet the critical shortage of the metal is to increase the price ceiling to meet the world price for lead which has been rising steadily in the face of a worldwide shortage. A figure of 8.50¢ to 8.75¢ per lb has been suggested by some, which would be a 30 pct or more rise. Whether even this price increase would bring in appreciable quantities is debatable for it would seem that the world price might well rise again to meet the U. S. price.

Since the Utah mine is still out of production, and current wage agreements call for only a 40-hr week, lead mine production will continue to remain below prestrike levels. Moreover there is a large irrigation project in progress in connection with the Grand Coulee dam which has been drawing away miners as the construction workers are paid 20¢ to 40¢ per hr more than the mine workers.

•

## Zinc Grades in Shortage

*New York*

• • • **Zinc is the one** nonferrous metal which is in good supply now. However, there is a serious shortage of Prime Western and Special High Grade. Producers consider that there is little likelihood of debasing the grades in good supply to meet the needs for the other grades by brass mills and foundries, and die casters since the government is the big holder.

The only solution for the problem would seem in the opinion of the trade to be the establishment of differentials in prices so as to put some incentive in the buying of grades with unnecessarily high purity.

Producers consider that there is less likelihood of a price increase of such large proportions in zinc, because of the supply position, as in the other nonferrous metals. This problem of the short supply grades is considered to require some action.

## Navy Expands Scrap Program

*Washington*

• • • **Boosted from an** original estimate of 15 million lb, the Navy has announced that it expects to produce more than 35 million lb of secondary aluminum ingot for commercial use under its program for the recovery of aluminum scrap from surplus aircraft. Recovery from prepared scrap, (THE IRON AGE, Apr. 11, p. 100) is about 80 pct and, according to the Navy, it is done at a cost within the limits of sales returns.

Standard melting units consisting of sloping hearth reverberatory furnaces with a capacity of 8000 to 10,000 lb each have been installed at naval air activities in Jacksonville, Fla., and Alameda and San Diego, Cal. Open pot furnaces are in operation at Miami, Fla., Norfolk, Va., and Corpus Christi, Tex.

Only 15,000 to 20,000 lb of scrap could be loaded in railroad cars in bulk form. By reducing it to a solid state, however, a maximum carloading of 100,000 lb was accomplished. Improved cutting and burning methods have reduced material handling to a minimum.

•

## Wire Bar Supply Down

*Washington*

• • • **Although the supply** of copper wire bars for June is forecast to be the lowest in several years, the Copper Wire and Cable Mill Industry Advisory Committee to CPA predicts that when the copper and coal strikes are over and other components become available the industry can more than meet requirements of the emergency housing program.

Only about 10,000 tons of these bars are now expected by CPA to be available in June or about 20 pct of average requirements of around 50,000 and 60,000 tons a month. Some 31,000 tons were available in April and an estimated 17,000 for May.

## Primary Metals

*(Cents per lb, unless otherwise noted)*

| | |
|---|---|
| Aluminum, 99+%, del'd (Min. 10,000 lb) | 15.00 |
| Aluminum pig | 14.00 |
| Antimony, American, Laredo, Tex. | 14.50 |
| Beryllium copper, 3.75-4.25% Be; dollars per lb contained Be | $14.75 |
| Beryllium aluminum, 5% Be; dollars per lb contained Be | $30.00 |
| Cadmium, del'd | 90.00 |
| Cobalt, 97-99% (per lb) | $1.50 to $1.57 |
| Copper, electro, Conn. valley | 12.00 |
| Copper, electro, New York | 11.75 |
| Copper, lake | 12.00 |
| Gold, U. S. Treas., dollars per oz. | $35.00 |
| Indium, 99.8%, dollars per troy oz | $ 2.25 |
| Iridium, dollars per troy oz. | $110.00 |
| Lead, St. Louis | 6.35 |
| Lead, New York | 6.50 |
| Magnesium, 99.9 + %, carlots | 20.50 |
| Magnesium, 12-in. sticks, carlots | 27.50 |
| Mercury, dollars per 76-lb flask, f.o.b. New York | $102 to $103 |
| Nickel, electro | 35.00 |
| Palladium, dollars per troy oz. | $24.00 |
| Platinum, dollars per troy oz. | $56.00 |
| Silver, New York, cents per oz. | 70.75 |
| Tin, Straits, New York | 52.00 |
| Zinc, East St. Louis | 8.25 |
| Zinc, New York | 8.65 |
| Zirconium copper, 6 pct Zr, per lb contained Zr | 6.00 |

## Remelted Metals

*(Cents per lb)*

| | |
|---|---|
| Aluminum, No. 12 Fdy. (No. 2) | 11.00 |
| Aluminum, deoxidizing Nos. 2, 3, 4 | 9.50 to 11.25 |
| Brass Ingot | |
| 85-5-5-5 (No. 115) | 13.25 |
| 88-10-2 (No. 215) | 16.75 |
| 80-10-10 (No. 305) | 16.00 |
| No. 1 Yellow (No. 405) | 10.25 |

## Copper, Copper Base Alloys

*(Mill base, cents per lb)*

| | Extruded Shapes | Rods | Sheets |
|---|---|---|---|
| Copper | 22.10 | .... | 22.08 |
| Copper, H.R. | .... | 18.60 | .... |
| Copper drawn | .... | 19.60 | .... |
| Low brass, 80% | .... | 21.43 | 20.81 |
| High brass | .... | .... | 21.48 |
| Red brass, 85% | .... | 21.64 | 21.69 |
| Naval brass | 21.40 | 20.15 | 25.83 |
| Brass, free cut | .... | 16.04 | .... |
| Commercial bronze, 90% | .... | 22.35 | 22.40 |
| Commercial bronze, 95% | .... | 22.56 | 22.61 |
| Manganese bronze | 25.10 | .... | 29.33 |
| Phos. bronze, A, B, 5% | .... | 39.02 | 38.77 |
| Muntz metal | 21.15 | 19.90 | 24.08 |
| Everdur, Herculoy, Olympic or equal | .... | 26.53 | 27.33 |
| Nickel silver, 5% | .... | 30.80 | 28.62 |
| Architect bronze | 20.15 | .... | .... |

## Aluminum

*(Cents per lb, base, subject to extras for quantity, gage, size, temper and finish)*

*Drawn tubing:* 2 to 3 in. OD by 0.065 in. wall: 3S, 43.5¢, 52S-O, 67¢ 24S-T, 71¢: base, 30,000 lb.

*Plate:* ¼ in. and heavier: 2S, 3S, 21.2¢; 52S, 24.2¢; 61S, 23.8¢; 24S, 24S-AL, 24.2¢; 75S, 75S-AL, 30.5¢; base, 30,000 lb and over.

*Flat Sheet:* 0.136-in. thickness: 2S, 3S, 23.7¢; 52S, 27.2¢; 61S, 24.7¢; 24S-O, 24S-OAL, 26.7¢; 75S-O, 75S-OAL, 32.7¢; base, 30,000 lb and over.

*Extruded Solid Shapes:* factor determined by dividing the perimeter of the shape by its weight per foot. For factor 1 through 4, 3S, 26¢; 14S, 32.5¢; 24S, 35¢; 53S, 61S, 28¢; 63S, 27¢; 75S, 45.5¢; base, 30,000 lb.

*Wire, Rod and Bar:* screw machine stock, rounds, 17S-T, ¼ in., 29.5¢; ½ in., 27.5¢; 1 in., 26¢; 2 in., 24.5¢; hexagons, ¼ in., 35.5¢; ½ in., 30¢ 1 in., 2 in., 27¢; base, 5000 lb. *Rod:* 2S, 3S, 1¼ to 2½ in. diam, rolled, 23¢; cold-finished, 23.5¢ base, 30,000 lb. *Round Wire:* drawn, coiled, B & S gage 17-18: 2S, 3S, 33.5¢; 56S, 39.5¢; 10,000 lb base; B & S gage 00-1: 2S, 3S, 21¢; 56S, 30.5¢; B & S 15-16: 2S, 3S, 32.5¢; 56S, 38¢; base, 30,000 lb.

*(Continued, See Next Column)*

## Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb or more, 46¢ a lb; 25 to 90 lb, 56¢; less than 25 lb, 66¢.

# NONFERROUS SCRAP METAL QUOTATIONS

*†(OPA basic maximum prices, cents per lb, f.o.b. point of shipment, subject to quality, quantity and special preparation premiums—other prices are current quotations)*

## Copper, Copper Base Alloys

***OPA Group 1†***

| | |
|---|---|
| No. 1 wire, No. 1 heavy copper | 9.75 |
| No. 1 tinned copper wire, No. 1 tinned heavy copper | 9.75 |
| No. 2 wire, mixed heavy copper | 8.75 |
| Copper tuyeres | 8.75 |
| Light copper | 7.75 |
| Copper borings | 9.75 |
| No. 2 copper borings | 8.75 |
| Lead covered copper wire, cable | 6.00• |
| Lead covered telephone, power cable | 6.04 |
| Insulated copper | 3.00• |

***OPA Group 2†***

| | |
|---|---|
| Bell metal | 15.50 |
| High grade bronze gears | 13.25 |
| High grade bronze solids | 11.50• |
| Low lead bronze borings | 11.50• |
| Babbitt lined brass bushings | 13.00 |
| High lead bronze solids | 10.00• |
| High lead bronze borings | 10.00• |
| Red trolley wheels | 10.75 |
| Tinny (phosphor bronze) borings | 10.50 |
| Tinny (phosphor bronze) solids | 10.50 |
| Copper-nickel solids and borings | 9.25 |
| Bronze paper mill wire cloth | 9.50 |
| Aluminum bronze solids | 9.00 |
| Soft red brass (No. 1 composition) | 9.00 |
| Soft red brass borings (No. 1) | 9.00 |
| Gilding metal turnings | 8.50 |
| Contaminated gilded metal solids | 8.00 |
| Unlined standard red car boxes | 8.25 |
| Lined standard red car boxes | 7.75 |
| Cocks and faucets | 7.75 |
| Mixed brass screens | 7.75 |
| Red brass breakage | 7.50 |
| Old nickel silver solids, borings | 6.25 |
| Copper lead solids, borings | 6.25 |
| Yellow brass castings | 6.00 |
| Automobile radiators | 7.25 |
| Zincy bronze borings | 7.00 |
| Zincy bronze solids | 8.00 |

***OPA Group 3***

| | |
|---|---|
| Fired rifle shells | 8.00 |
| Brass pipe | 7.25 |
| Old rolled brass | 6.75 |
| Admiralty condenser tubes | 7.25 |
| Muntz metal condenser tubes | 6.75 |
| Plated brass sheet, pipe reflectors | 6.25 |
| Manganese bronze solids | 5.50[1] |
| Manganese bronze solids | 4.50[2] |
| Manganese bronze borings | 4.00[1] |

***OPA Group 4***

| | |
|---|---|
| Refinery brass | 4.50• |

•Price varies with analysis. [1] Lead content 0.00 to 0.40 pct. [2] Lead content 0.41 to 1.00 pct.

## Brass Mill Scrap†

| | |
|---|---|
| Briquetted cartridge brass turnings | 8.625 |
| Cartridge brass turnings, loose | 7.875 |
| Loose yellow brass trimmings | 7.875 |

## Aluminum*

***Plant scrap, segregated***

| | |
|---|---|
| 2S solids | 8.50 to 9.00 |
| Dural alloys, solids 14, 17, 18, 24S, 25S | 5.00 to 5.50 |
| turnings, dry basis | 3.50 to 4.00 |
| Low copper, alloys 51, 52, 61, 63S solids | 7.00 to 8.00 |
| turnings, dry basis | 5.00 to 6.50 |

***Plant scrap, mixed***

| | |
|---|---|
| Solids | 5.25 |
| Turnings, dry basis | 4.00 |

***Obsolete scrap***

| | |
|---|---|
| Pure cable | 8.00 |
| Old sheet and utensils | 7.50 |
| Old castings and forgings | 6.00 |
| Pistons, free of struts | 5.00 |
| Pistons, with struts | 4.50 |
| Old alloy sheet | 3.00 to 4.00 |

## Magnesium*

***Segregated plant scrap***

| | |
|---|---|
| Pure solids and all other solids, exempt | |
| Borings and turnings | 1.50 |

***Mixed, contaminated plant scrap***

| | |
|---|---|
| Grade 1 solids | 3.00 |
| Grade 1 borings and turnings | 2.00 |
| Grade 2 solids | 2.00 |
| Grade 2 borings and turnings | 1.00 |

•Nominal.

## Zinc

| | |
|---|---|
| New zinc clippings, trimmings | 6.50 |
| Engravers, lithographers plates | 6.50 |
| Old zinc scrap | 4.75 |
| Unsweated zinc dross | 5.00 |
| Die cast slab | 4.50 |
| New die cast scrap | 4.45 |
| Radiator grilles, old and new | 3.50 |
| Old die cast scrap | 3.00 |

## Lead

Deduct 0.55¢ a lb from refined metal basing point prices or soft and hard lead including cable, for f.o.b. point of shipment price.

## Nickel

Ni content 98+%, Cu under ½%, 23¢ per lb; 90 to 98% Ni, 23¢ per lb contained Ni.

# ELECTROPLATING ANODES AND CHEMICALS

***Anodes***

*(Cents per lb, f.o.b. shipping point in 500 lb lots)*

| | |
|---|---|
| Copper, frt. allowed | |
| Cast, oval, 15 in. or longer | 25⅛ |
| Electrodeposited | 18⅞ |
| Rolled, oval, straight | 19⅜ |
| Curved | 20⅜ |
| Brass, 80-20, frt allowed | |
| Cast, oval, 15 in. or longer | 23⅝ |
| Zinc, cast, 99.99, 15 in. or longer | 16¼ |
| Nickel, 99 pct plus, frt allowed | |
| Cast | 47 |
| Rolled, depolarized | 48 |
| Silver, 999 fine | |
| Rolled, 100 oz. lots, per oz. | 80¾ |

***Chemicals***

*(Cents per lb, f.o.b. shipping point)*

| | |
|---|---|
| Copper cyanide, 1-5 bbls | 34.00 |
| Copper sulphate, 99.5, crystals, bbls | 7.75 |
| Nickel salts, single, 425 lb bbls, frt allowed | 13.50 |
| Silver cyanide, 100 oz lots, per oz. | 0.655 |
| Sodium cyanide, 96 pct, domestic, 100 lb drums | 15.00 |
| Zinc cyanide, 100 lb drums | 33.00 |
| Zinc sulphate, 89 pct, crystals, bbls, frt allowed | 6.35 |

# SCRAP

**. . . News and Market Activities**

## Foresee Long Period of Scrap Shortage

***New York***

**• • • It is significant** that with a sharply declining ingot rate due to shortages of coal, pig iron and dolomite, there is no lack of consumer demand for every grade of scrap. In many areas where mills are reported to be closing down completely for a week or two, cancellations have not been issued on scrap shipments. This indicates that mill supplies of scrap are in a critical position and that this material may also have contributed toward the mill close-downs.

The short-lived rail strike did not seriously reduce scrap movement, except that it delayed loaded cars for a few days. However, those cars got under way to consignees not more than a few days later.

While scrap movement is reported to be exceedingly slow, observers are of the opinion that this is not due to any effort on the part of dealers or brokers to hold back deliveries or preparation pending action by OPA on increases of price ceilings. Inquiry among the trade has revealed the fact that the possibility of prospective increases for scrap is not likely to be taken up with price executives as the consensus of the industry advisory committee is still opposed to such a move.

Dealers are reported to be attempting to distribute the available supply of scrap as equitably as possible in order to keep all consumers in production.

•

*PITTSBURGH* — The end of the rail strike saw the resumption of scrap movement, and with operations in this area at a new low ebb, it seems that mills should be stocking some scrap. Scrap demand is great, from mills and foundries. Foundries, both steel and iron, are in a bad way for scrap and are willing to pay practically any price. Springboards offered for various grades of scrap in the Pittsburgh area: No. 1 heavy melting, $1 to $2.27; cupola cast, $5 to $6; heavy breakable cast, about $4; rails for cutting into short lengths, $3 to $4; low phos, $1 to $2.27, and couplers, knuckles, springs and wheels several dollars. Some low phos is moving in from the Eastern Seaboard. The willingness to pay larger springboards, however, is equal in all districts so that the net result is that no area gets an unusual amount of scrap.

•

*CHICAGO*—Scrap receipts skipped a beat last week during the short-lived rail strike, but the lapse proved more serious for foundry consumers than for the mills. Demand continues unabated despite lower operating rates by the two principal mill consumers. Rejections are reported at low ebb, indicating the heavy need for all carbon grades.

•

*PHILADELPHIA*—A number of eastern Pennsylvania mills have already closed down their production for one or two weeks, although one is reported to be resuming the operation of two open-hearths, and others are giving this action consideration. However all mills are requesting continuation of scrap shipments. Scrap supply is reported to be very lean.

•

*DETROIT*—The scrap situation here is rapidly becoming more critical. With scrap generation by motor plants far below normal and much of the scrap produced ear-marked for foundry or steel suppliers of the automobile companies, the usual market flow has been very much on a restricted basis. At the same time, city and country collections have fallen below expected levels because of rising costs and price restrictions. There is no indication that stocks are being held for higher prices or that scrap quality has suffered in the face of low profit margins. Up to the present time, the transportation tie-up has had a minimum effect.

•

*BOSTON* — Foundries have had the scrap trade pretty much to themselves, but cast and low phos are being doled out to them in truck lots. Their position is not only aggravated by a lack of scrap but a dearth of pig iron as well, and it is almost certain many will be forced to close by the end of another week railroad strike or no. Yards are storing scrap in anticipation of shipment renewals, but are not getting much.

•

*NEW YORK*—The railroad tieup last week almost completely halted scrap movement in this area. With this obstacle now removed, recovery operations were temporarily upset by the heavy rainfall during the early part of this week. The scrap supply levels continue far in arrears of the heavy demand for all grades due to the erratic output of scrap-producinig factors.

•

*BUFFALO*—The rail strike resulted in a brief holdup of shipments to consumers, but disruption of steel mill and foundry schedules brought no letdown in the heavy buying demand. Yards operated without interruption, processing and piling material in hand. As the steel rate recovered this week, pressure for deliveries showed a corresponding increase. Substitution of scrap for pig iron has made big inroads in consumers' stockpiles generally, even though furnace operations are subnormal. A resumption of lake and barge shipments into Buffalo is expected next month, but none is en route at the present time.

•

*CLEVELAND*—The shortage of scrap here is acute. Shipments are falling further behind consumption, scrap is being generated even more slowly than it has in recent weeks, and many small consumers are operating on a day-to-day basis. Some of the larger consumers are in such a position that they felt sharply the effects of the temporary rail tie-up, and one mill is putting on what amounts to a nation-wide campaign for scrap. Consumers are willing to pay almost any springboard.

•

*ST. LOUIS*—The combination of the railroad and coal strike tended to cut down incoming shipments of scrap but this was somewhat offset by the amount of material piling up in hands of consumers due to strikes. For example, one steel mill has more than 300 carloads in the yards upon which demurrage is being paid, besides heavy stock piles and other material in hands of dealers resulting in an embargo. Another mill has shut off shipments for a week, and still another has been closed for several weeks. One result is that some scrap originating in the St. Louis area is being delivered to Chicago where it is badly needed.

•

*CINCINNATI*—Tightness of the district scrap market becomes more severe daily. Flow of scrap into the area is declining, while demand, on the other hand, appears to be steadily stronger. Much of the demand is attributed to the shipping problem and the lack of pig iron for foundry melts. Quality of material is reported to be not good, and in many instances, melters are accepting lower grade materials doing the best they can in an effort to keep up operations.

•

*BIRMINGHAM*—Following the end of the railroad strike, a scramble for material has developed here. All grades are in heavy demand at ceiling prices. Railroad and industrial scrap production is extremely limited, and the small movement to dealers' yards consists principally of off grades such as light sheet scrap.

•

*TORONTO*—With curtailment in shipments of scrap iron and steel from western Canada to eastern consuming points to permit increased deliveries of western coal to Ontario, consumers are facing further difficulties in obtaining scrap. Dealers report fair deliveries of secondary grades, but overall supply is only about 50 pct of requirements, and practically all receipts are steel grades. Mills report small stockpiles and big consumers now are facing more drastic curtailment in steelmaking operations due to scrap, pig iron and coal shortages.

# IRON AND STEEL SCRAP PRICES

Going prices as obtained in the trade by IRON AGE editors, based on representative tonnages. Where asterisks are used on quotations below, this indicates a ceiling price to which must be added brokerage fee and adjusted freight.

## PITTSBURGH

**Per gross ton delivered to consumers:**

| | |
|---|---|
| No. 1 hvy. melting | $20.00* |
| RR. hvy. melting | 21.00* |
| No. 2 hvy. melting | 20.00* |
| RR. scrap rails | 21.50* |
| Rails 3 ft. and under | 23.50* |
| No. 1 comp'd sheets | 20.00* |
| Hand bdld. new shts. | 20.00* |
| Hvy. axle turn. | 19.50* |
| Hvy. steel forge turn. | 19.50* |
| Mach. shop turn. | 15.00* |
| Short shov. turn. | 17.00* |
| Mixed bor. and turn. | 15.00* |
| Cast iron borings | 16.00* |
| Hvy. break cast. | 16.50* |
| No. 1 cupola | 20.00* |
| RR. knuck. and coup. | 24.50* |
| RR. coil springs | 24.50* |
| Rail leaf springs | 24.50* |
| Rolled steel wheels | 24.50* |
| Low phos. bil. crops | 25.00* |
| Low phos. | 22.50* |
| RR. malleable | 22.00* |

## CHICAGO

**Per gross ton delivered to consumer:**

| | |
|---|---|
| No. 1 hvy. melting | $18.75* |
| No. 2 hvy. melting | 18.75* |
| No. 1 bundles | 18.75* |
| No. 2 dealers' bndls. | 18.75* |
| Bundled mach. shop turn. | 18.75* |
| Galv. bundles | 16.75* |
| Mach. shop turn. | 13.75* |
| Short shovels, turn. | 15.75* |
| Cast iron borings | 14.75* |
| Mix. borings & turn. | 13.75* |
| Low phos. hvy. forge | 23.75* |
| Low phos. plates | 21.25* |
| No. 1 RR. hvy. melt. | 19.75* |
| Reroll rails | 22.25* |
| Miscellaneous rails | 20.25* |
| Angles & splice bars | 22.25* |
| Locomotive tires, cut | 24.25* |
| Cut bolsters & side frames | 22.25* |
| Standard stl. car axles | 25.75* |
| No. 3 steel wheels | 23.25* |
| Couplers & knuckles | 23.25* |
| Agricul. malleable | 22.00* |
| RR. malleable | 22.00* |
| No. 1 mach. cast. | 20.00* |
| Rails 3 ft. and under | 22.25* |
| No. 1 agricul. cast. | 20.00* |
| Hvy. breakable cast. | 16.50* |
| RR. grate bars | 15.25* |
| Cast iron brake shoes | 15.25* |
| Stove plate | 19.00* |
| Clean auto cast. | 20.00* |
| Cast iron carwheels | 20.00* |

## CINCINNATI

**Per gross ton delivered to consumer:**

| | |
|---|---|
| No. 1 hvy. melting | $19.50* |
| No. 2 hvy. melting | 19.50* |
| No. 1 bundles | 19.50* |
| **No. 2 bundles** | 19.50* |
| Mach. shop turn. | $10.50 to 11.00 |
| Shoveling turn. | 12.50 to 13.00 |
| Cast iron borings | 11.50 to 12.00 |
| Mixed bor. & turn. | 11.50 to 12.00 |
| Low phos. plate | 22.00* |
| No. 1 cupola cast. | 20.00* |
| Hvy. breakable cast. | 16.50* |
| Stove plate | 19.00* |
| Scrap rails | 21.00* |

## BOSTON

**Dealers' buying prices per gross ton, f.o.b. cars**

| | |
|---|---|
| No. 1 hvy. melting | $15.05* |
| No. 2 hvy. melting | 15.05* |
| Nos. 1 and 2 bundles | 15.05* |
| Busheling | 15.05* |
| Turnings, shovelings | 12.05* |
| Machine shop turn. | 10.05* |
| Mixed bor. & turn. | 10.05* |
| Cl'n cast, chem. bor. | $13.06 to 14.15* |

***Truck delivery to foundry***

| | |
|---|---|
| Machinery cast. | 21.00 to 23.51* |
| Breakable cast. | 21.57 to 21.87* |
| Stove plate | 20.00 to 23.51* |

## DETROIT

**Per gross ton, brokers' buying prices:**

| | |
|---|---|
| No. 1 hvy. melting | $17.32* |
| No. 2 hvy. melting | 17.32* |
| No. 1 bundles | 17.32* |
| New busheling | 17.32* |
| Flashings | 17.32* |
| Mach. shop turn. | 12.32* |
| Short shov. turn. | 14.32* |
| Cast iron borings | 13.32* |
| Mixed bor. & turn. | 12.32* |
| Low phos. plate | 19.82* |
| No. 1 cupola cast. | 20.00* |
| Charging box cast. | 19.00* |
| Hvy. breakable cast. | 16.50* |
| Stove plate | 19.00* |
| Automotive cast. | 20.00* |

## PHILADELPHIA

**Per gross ton delivered to consumer:**

| | |
|---|---|
| No. 1 hvy. melting | $18.75* |
| No. 2 hvy. melting | 18.75* |
| No. 2 bundles | 18.75* |
| Mach. shop turn. | 13.75* |
| Shoveling turn. | 15.75* |
| Cast iron borings | 14.75* |
| Mixed bor. & turn. | 13.75* |
| No. 1 cupola cast. | 20.00* |
| Hvy. breakable cast. | 16.50* |
| Cast, charging box | 19.00* |
| Hvy. axle forge turn. | 18.25* |
| Low phos. plate | 21.25* |
| Low phos. punchings | 21.25* |
| Billet crops | 21.25* |
| RR. steel wheels | 23.25* |
| RR. coil springs | 23.25* |
| RR. malleable | 22.00* |

## ST. LOUIS

**Per gross ton delivered to consumer:**

| | |
|---|---|
| Heavy melting | $17.50* |
| Bundled sheets | 17.50* |
| Mach. shop turn. | 12.50* |
| Locomotive tires, uncut. | $18.50 to 19.00 |
| Misc. std. sec. rails | 19.00* |
| Rerolling rails | 21.00* |
| Steel angle bars | 21.00* |
| Rails 3 ft and under | 21.50* |
| RR. springs | 22.00* |
| Steel car axles | 24.50* |
| Stove plate | 19.00* |
| Grate bars | 15.25* |
| Brake shoes | 15.25* |
| RR. malleable | 22.00* |
| Cast iron carwheels | 20.00* |
| No. 1 mach'ery cast | 20.00* |
| Breakable cast. | 16.50* |

## BIRMINGHAM

**Per gross ton delivered to consumer:**

| | |
|---|---|
| No. 1 hvy. melting | $17.00* |
| No. 2 hvy. melting | 17.00* |
| No. 2 bundles | 17.00* |
| No. 1 busheling | 17.00* |
| Long turnings | 12.00* |
| Shoveling turnings | 14.00* |
| Cast iron borings | 13.00* |
| Bar crops and plate | $18.50 to 19.50* |
| Structural and plate | 18.50 to 19.50* |
| No. 1 cast | 20.00* |
| Stove plate | 19.00* |
| Steel axles | 18.50* |
| Scrap rails | 18.50 |
| Rerolling rails | 20.50* |
| Angles & splice bars | 20.50 to 21.00 |
| Rails 3 ft. & under | 21.00* |
| Cast iron carwheels | 17.50 to 18.00 |

## YOUNGSTOWN

**Per gross ton delivered to consumer:**

| | |
|---|---|
| No. 1 hvy. melting | $20.00* |
| No. 2 hvy. melting | 20.00* |
| Low phos. plate | 22.50* |
| No. 1 busheling | 20.00* |
| Hydraulic bundles | 20.00* |
| Mach. shop turn. | 15.00* |
| Short shovel. turn. | 17.00* |
| Cast iron borings | 16.00* |

## NEW YORK

**Brokers' buying prices per gross ton, on cars:**

| | |
|---|---|
| No. 1 hvy. melting | $15.33* |
| No. 2 hvy. melting | 15.33* |
| Comp. black bundles | 15.33* |
| Comp. galv. bundles | 13.33* |
| Mach. shop turn. | 10.33* |
| Mixed bor. & turn. | 10.33* |
| Shoveling turn. | 12.33* |
| No. 1 cupola cast | 20.00* |
| Hvy. breakable cast | 16.50* |
| Charging box cast | 19.00* |
| Store plate | 19.00* |
| Clean auto cast | 20.00* |
| Unstrip. motor blks. | 17.50* |
| Cl'n chem. cast bor. | 14.33* |

## BUFFALO

**Per gross ton delivered to consumer:**

| | |
|---|---|
| No. 1 hvy. melting | $19.25* |
| No. 1 bundles | 19.25* |
| No. 2 bundles | 19.25* |
| No. 2 hvy. melting | 19.25* |
| Mach. shop turn. | 14.25* |
| Shoveling turn. | 16.25* |
| Cast iron borings | 14.25* |
| Cast iron borings | 15.25* |
| Mixed bor. & turn. | 14.25* |
| Stove plate | 19.00* |
| Low phos. plate | 21.75* |
| Scrap rails | 20.75* |
| Rails 3 ft. & under | 22.75* |
| RR. steel wheels | 23.75* |
| Cast iron car wheels | 20.00* |
| RR. coil & leaf spgs. | 23.75* |
| RR. knuckles & coup. | 23.75* |
| RR. malleable | 22.00* |
| No. 1 busheling | 19.25* |

## CLEVELAND

**Per gross ton delivered to consumer:**

| | |
|---|---|
| No. 1 hvy. melting | $19.50* |
| No. 2 hvy. melting | 19.50* |
| Compressed sheet stl. | 19.50* |
| Drop forge flashings | 19.00 |
| No. 2 bundles | 19.50* |
| Mach. shop turn. | 14.50* |
| Short shovel. | 16.50* |
| No. 1 busheling | 19.50* |
| Steel axle turn. | 19.00* |
| Low phos. billet and bloom crops | 24.50* |
| Cast iron borings | 15.50* |
| Mixed bor. & turn. | 14.50* |
| No. 2 busheling | 17.00* |
| No. 1 machine cast | 20.00* |
| Railroad cast | 20.00* |
| Railroad grate bars | 15.25* |
| Stove plate | 19.00* |
| RR. hvy. melting | 20.50* |
| Rails 3 ft. & under | 23.00* |
| Rails 18 in. & under | 24.25* |
| Rails for rerolling | 23.00* |
| Railroad malleable | 22.00* |
| Elec. furnace punch | 22.00* |

## SAN FRANCISCO

**Per gross ton delivered to consumer:**

| | |
|---|---|
| RR. hvy. melting | $16.00 to $16.75 |
| No. 1 hvy. melting | 16.00 to 16.75 |
| No. 2 hvy. melting | 16.00 to 16.75 |
| No. 2 bales | 14.00 to 14.75 |
| No. 3 bales | 8.50 to 9.25 |
| Mach. shop turn. | 6.50 to 7.25 |
| Elec. furn. 1 ft. und. | 15.50 to 17.00 |
| No. 1 cupola cast | 19.00 to 21.00 |

## LOS ANGELES

**Per gross ton delivered to consumer:**

| | |
|---|---|
| No. 1 hvy. melting | $15.50 to $16.25 |
| No. 2 hvy. melting | 14.50 to 15.25 |
| No. 1 bales | 14.50 to 15.25 |
| No. 2 bales | 13.50 to 14.25 |
| No. 3 bales | 8.00 to 9.00 |
| Mach. shop turn. | 7.00 |
| No. 1 cupola cast. | 19.00 to 21.00 |

## SEATTLE

**Per gross ton delivered to consumer:**

| | |
|---|---|
| RR. hvy. melting | $14.50* |
| No. 1 & No. 2 hvy. melting | 14.50* |
| Elec. furn. 1 ft. und. | $14.00 to 15.00 |
| No. 1 cupola cast | 20.00* |

## HAMILTON, ONT.

**Per gross ton delivered to consumer:**

| | |
|---|---|
| Heavy melting | $17.50* |
| No. 1 bundles | 17.50* |
| No. 2 bundles | 17.00* |
| Mixed steel scrap | 15.50* |
| Rails, remelting | 18.50* |
| Rails, rerolling | 21.50* |
| Bushelings | 13.00* |
| Mixed borings & turnings | 12.50* |
| Electric furnace bundles | 20.50* |
| Manganese steel scrap | 20.00* |
| No. 1 cast | 19.00* |
| Stove plate | 17.50* |
| Car wheels, cast | 19.50* |
| Malleable iron | 16.00* |

# Comparison of Prices . .

Advances over past week in **Heavy Type**; declines in *Italics*. Prices are f.o.b. major basing points. The various basing points for finished and semifinished steel are listed in the detailed price tables.

| Flat-Rolled Steel: (cents per pound) | May 28, 1946 | May 21, 1946 | Apr. 23, 1946 | May 29, 1945 |
|---|---|---|---|---|
| Hot-rolled sheets | 2.425 | 2.425 | 2.425 | 2.20 |
| Cold-rolled sheets | 3.275 | 3.275 | 3.275 | 3.05 |
| Galvanized sheets (24 ga.) | 4.05 | 4.05 | 4.05 | 3.70 |
| Hot-rolled strip | | | | |
| 6-in. and under | 2.45 | 2.45 | 2.45 | 2.10 |
| Over 6 in. | 2.35 | 2.35 | 2.35 | 2.10 |
| Cold-rolled strip | 3.05 | 3.05 | 3.05 | 2.80 |
| Plates | 2.50 | 2.50 | 2.50 | 2.25 |
| Plates, wrought iron | 4.112 | 4.112 | 4.112 | 3.80 |
| Stain's c-r strip (No. 302) | 28.00 | 28.00 | 28.00 | 28.00 |
| **Tin and Terneplate:** (dollars per base box) | | | | |
| Tinplate, standard cokes. | $5.25 | $5.25 | $5.25 | $5.00 |
| Tinplate, electro (0.50 lb) | 4.75 | 4.75 | 4.75 | 4.50 |
| Special coated mfg. ternes | 4.55 | 4.55 | 4.55 | 4.30 |
| **Bars and Shapes:** (cents per pound) | | | | |
| Merchant bars | 2.50 | 2.50 | 2.50 | 2.25 |
| Cold-finished bars | 3.10 | 3.10 | 3.10 | 2.65 |
| Alloy bars | 2.92 | 2.92 | 2.92 | 2.70 |
| Structural shapes | 2.35 | 2.35 | 2.35 | 2.10 |
| Stainless bars (No. 302) | 24.00 | 24.00 | 24.00 | 24.00 |
| Wrought iron bars | 4.76 | 4.76 | 4.76 | 4.40 |
| **Wire and Wire Products:** (cents per pound) | | | | |
| Bright wire | 3.05 | 3.05 | 3.05 | 2.75 |
| Wire nails | 3.25 | 3.25 | 3.25 | 2.90 |
| **Rails:** (dollars per net ton) | | | | |
| Heavy rails | $43.39 | $43.39 | $43.39 | $43.00 |
| Light rails | 49.18 | 49.18 | 49.18 | 45.00 |
| **Semifinished Steel:** (dollars per gross ton) | | | | |
| Rerolling billets | $39.00 | $39.00 | $39.00 | $36.00 |
| Sheet bars | 38.00 | 38.00 | 38.00 | 36.00 |
| Slabs, rerolling | 39.00 | 39.00 | 39.00 | 36.00 |
| Forging billets | 47.00 | 47.00 | 47.00 | 45.00 |
| Alloy blooms, billets, slabs | 58.43 | 58.43 | 58.43 | 54.00 |
| **Wire Rods and Skelp:** (cents per pound) | | | | |
| Wire rods | 2.30 | 2.30 | 2.30 | 2.15 |
| Skelp | 2.05 | 2.05 | 2.05 | 1.90 |

| Pig Iron: (per gross ton) | May 28, 1946 | May 21, 1946 | Apr. 23, 1946 | May 29, 1945 |
|---|---|---|---|---|
| No. 2 foundry, Phila. | $28.34 | $28.34 | $28.34 | $26.84 |
| No. 2, Valley furnace | 26.50 | 26.50 | 26.50 | 25.00 |
| No. 2, Southern, Cin'ti | 26.94 | 26.94 | 26.94 | 25.44 |
| No. 2, Birmingham | 22.88 | 22.88 | 22.88 | 21.38 |
| No. 2 foundry, Chicago† | 26.50 | 26.50 | 26.50 | 25.00 |
| Basic, del'd eastern Pa. | 27.84 | 27.84 | 27.84 | 26.34 |
| Basic, Valley furnace | 26.00 | 26.00 | 26.00 | 24.50 |
| Malleable, Chicago† | 26.50 | 26.50 | 26.50 | 25.00 |
| Malleable, Valley | 26.50 | 26.50 | 26.50 | 25.00 |
| L. S. charcoal, Chicago | 42.34 | 42.34 | 42.34 | 42.34 |
| Ferromanganese‡ | 135.00 | 135.00 | 135.00 | 135.00 |

† The switching charge for delivery to foundries in the Chicago district is 60¢ per ton.
‡ For carlots at seaboard.

| Scrap: (per gross ton) | | | | |
|---|---|---|---|---|
| Heavy melt'g steel, P'gh. | $20.00 | $20.00 | $20.00 | $20.00 |
| Heavy melt'g steel, Phila. | 18.75 | 18.75 | 18.75 | 18.00 |
| Heavy melt'g steel, Ch'go | 18.75 | 18.75 | 18.75 | 18.75 |
| No. 1 hy. comp. sheet, Det. | 17.32 | 17.32 | 17.32 | 17.32 |
| Low phos. plate, Youngs'n | 22.50 | 22.50 | 22.50 | 22.50 |
| No. 1 cast, Pittsburgh | 20.00 | 20.00 | 20.00 | 20.00 |
| No. 1 cast, Philadelphia | 20.00 | 20.00 | 20.00 | 20.00 |
| No. 1 cast, Chicago | 20.00 | 20.00 | 20.00 | 20.00 |
| **Coke, Connellsville:** (per net ton at oven) | | | | |
| Furnace coke, prompt | $7.50 | $7.50 | $7.50 | $7.50 |
| Foundry coke, prompt | 9.00 | 9.00 | 9.00 | 9.00 |
| **Nonferrous Metals:** (cents per pound to large buyers) | | | | |
| Copper, electro., Conn. | 12.00 | 12.00 | 12.00 | 12.00 |
| Copper, Lake | 12.00 | 12.00 | 12.00 | 12.00 |
| Tin, Straits, New York | 52.00 | 52.00 | 52.00 | 52.00 |
| Zinc, East St. Louis | 8.25 | 8.25 | 8.25 | 8.25 |
| Lead, St. Louis | 6.35 | 6.35 | 6.35 | 6.35 |
| Aluminum, virgin, del'd. | 15.00 | 15.00 | 15.00 | 15.00 |
| Nickel, electrolytic | 35.00 | 35.00 | 35.00 | 35.00 |
| Magnesium, ingot | 20.50 | 20.50 | 20.50 | 20.50 |
| Antimony, Laredo, Tex. | 14.50 | 14.50 | 14.50 | 14.50 |

# Composite Prices . .

Starting with the issue of Apr. 22, 1943, the weighted finished steel index was revised for the years 1941, 1942 and 1943. See explanation of the change on p. 90 of the Apr. 22, 1943, issue. Index revised to a quarterly basis as of Nov. 16, 1944; for details see p. 98 of that issue. The finished steel composite prices for the current quarter are an estimate based on finished steel shipments for the previous quarter. These figures will be revised when the actual data of shipments for this quarter are compiled.

| | FINISHED STEEL | PIG IRON | SCRAP STEEL |
|---|---|---|---|
| May 28, 1946 | 2.69516¢ per lb. | $26.12 per gross ton | $19.17 per gross ton |
| One week ago | 2.69516¢ per lb. | $26.12 per gross ton | $19.17 per gross ton |
| One month ago | 2.69516¢ per lb. | $26.12 per gross ton | $19.17 per gross ton |
| One year ago | 2.42471¢ per lb. | $24.61 per gross ton | $18.92 per gross ton |

| | FINISHED STEEL HIGH | FINISHED STEEL LOW | PIG IRON HIGH | PIG IRON LOW | SCRAP STEEL HIGH | SCRAP STEEL LOW |
|---|---|---|---|---|---|---|
| 1946 | 2.69516¢ Feb. 19 | 2.44104¢ Jan. 1 | $26.12 Mar. 19 | $25.37 Jan. 1 | $19.17 | $19.17 |
| 1945 | 2.44104¢ Oct. 2 | 2.38444¢ Jan. 2 | 25.37 Oct. 23 | 23.61 Jan. 2 | $19.17 Jan. 2 | $18.92 May 22 |
| 1944 | 2.30837¢ Sept. 5 | 2.21189¢ Oct. 5 | $23.61 | $23.61 | 19.17 Jan. 11 | 15.76 Oct. 24 |
| 1943 | 2.29176¢ | 2.29176¢ | 23.61 | 23.61 | $19.17 | $19.17 |
| 1942 | 2.28249¢ | 2.28249¢ | 23.61 | 23.61 | 19.17 | 19.17 |
| 1941 | 2.43078¢ | 2.43078¢ | $23.61 Mar. 20 | $23.45 Jan. 2 | $22.00 Jan. 7 | $19.17 Apr. 10 |
| 1940 | 2.30467¢ Jan. 2 | 2.24107¢ Apr. 16 | 23.45 Dec. 23 | 22.61 Jan. 2 | 21.83 Dec. 30 | 16.04 Apr. 9 |
| 1939 | 2.35367¢ Jan. 3 | 2.26689¢ May 16 | 22.61 Sept. 19 | 20.61 Sept. 12 | 22.50 Oct. 3 | 14.08 May 16 |
| 1938 | 2.58414¢ Jan. 4 | 2.27207¢ Oct. 18 | 23.25 June 21 | 19.61 July 6 | 15.00 Nov. 22 | 11.00 June 7 |
| 1937 | 2.58414¢ Mar. 9 | 2.32263¢ Jan. 4 | 23.25 Mar. 9 | 20.25 Feb. 16 | 21.92 Mar. 30 | 12.67 June 9 |
| 1936 | 2.32263¢ Dec. 28 | 2.05200¢ Mar. 10 | 19.74 Nov. 24 | 18.73 Aug. 11 | 17.75 Dec. 21 | 12.67 June 8 |
| 1935 | 2.07642¢ Oct. 1 | 2.06492¢ Jan. 8 | 18.84 Nov. 5 | 17.83 May 14 | 13.42 Dec. 10 | 10.33 Apr. 29 |
| 1934 | 2.15367¢ Apr. 24 | 1.95757¢ Jan. 2 | 17.90 May 1 | 16.90 Jan. 27 | 13.00 Mar. 13 | 9.50 Sept. 25 |
| 1933 | 1.95578¢ Oct. 3 | 1.75836¢ May 2 | 16.90 Dec. 5 | 13.56 Jan. 3 | 12.25 Aug. 8 | 6.75 Jan. 3 |
| 1932 | 1.89196¢ July 5 | 1.83901¢ Mar. 1 | 14.81 Jan. 5 | 13.56 Dec. 6 | 8.50 Jan. 12 | 6.43 July 5 |
| 1931 | 1.99626¢ Jan. 13 | 1.86586¢ Dec. 29 | 15.90 Jan. 6 | 14.79 Dec. 15 | 11.33 Jan. 6 | 8.50 Dec. 29 |
| 1930 | 2.25488¢ Jan. 7 | 1.97319¢ Dec. 9 | 18.21 Jan. 7 | 15.90 Dec. 16 | 15.00 Feb. 18 | 11.25 Dec. 9 |
| 1929 | 2.31773¢ May 28 | 2.26498¢ Oct. 29 | 18.71 May 14 | 18.21 Dec. 17 | 17.58 Jan. 29 | 14.08 Dec. 3 |

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 pct of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo Valley and Birmingham.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.


**Designers of modern machines and equipment are developing many applications for J&L Electricweld mechanical tubing that save machining costs, increase strength without increasing weight, and improve the appearance of the finished product. J&L Electricweld mechanical tubing is produced from J&L Controlled Quality strip by men of experience and skill. We invite your inquiry. Write or phone your nearest J&L District Sales Office.**

**JONES & LAUGHLIN STEEL CORPORATION**
**PITTSBURGH, PA.**

# Iron and Steel Prices...

Steel prices shown here are f.o.b. basing points, in cents per pound or dollars per gross ton. Extras apply. Delivered prices do not reflect 3 pct tax on freight. (1) Mill run sheet, 10¢ per 100 lb under base; primes, 25¢ above base. (2) Unassorted commercial coating. (3) Widths up to 12-in. inclusive. (4) 0.25 carbon and less. (5) Applies to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. Discount of 25¢ per 100 lb to fabricators. (8) Also shafting. For quantities of 20,000 lb to 39,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (11) Boxed. (12) This base price for annealed, bright finish wires, commercial spring wire. (13) Produced to dimensional tolerances in AISI Manual Sect. 6. (14) Billets only. (15) 9/32 in. to 47/64 in., 0.15¢ per lb higher.

| Basing Points | Pitts-burgh | Chicago | Gary | Cleve-land | Birm-ingham | Buffalo | Youngs-town | Spar-rows Point | Granite City | Middle-town, Ohio | Gulf Ports, Cars | 10 Pacific Ports, Cars | DELIVERED TO Detroit | New York | Phila-delphia |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **INGOTS** | | | | | | | | | | | | | | | |
| Carbon, rerolling | ($33.00 f. o. b. mill) | | | | | | | | | | | | | | |
| Carbon, forging | $38 | $38 | $38 | $38 | $38 | $38 | $38 | | | | | | | | |
| Alloy | $48.69 | $48.69 | | | | $48.69 | (Bethlehem, Massillon, Canton, Coatesville=$48.69) | | | | | | | | |
| **BILLETS, BLOOMS, SLABS** | | | | | | | | | | | | | | | |
| Carbon, rerolling | $39 | $39 | $39 | $39 | $39 | $39 | $39 | $39 | | | | $51[14] | $41 | | |
| | | | | | | (Provo=$50.20, Duluth=$41[14]) | | | | | | | | | |
| Carbon, forging billets | $47 | $47 | $47 | $47 | $47 | $47 | $47 | | | | | $59[14] | $49 | | |
| | | | | | | (Provo=$58.20, Duluth=$49[14]) | | | | | | | | | |
| Alloy | $58.43 | $58.43 | | | | $58.43 | (Bethlehem, Massillon, Canton=$58.43) | | | | | | $60.59 | | |
| **SHEET BARS** | $38 | $38 | | $38 | | $38 | $38 | $38 | (Canton=$38) | | | | | | |
| **PIPE SKELP** | 2.05¢ | 2.05¢ | | | | | 2.05¢ | 2.05¢ | (Coatesville=2.05¢) | | | | | | |
| **WIRE RODS** [15] | | | | | | | | | | | | | | | |
| No. 5 to 9/32 in. | 2.30¢ | 2.30¢ | | 2.30¢ | 2.30¢ | (Worcester=2.40¢) | | | | | 2.55¢ | 2.80¢ | | | |
| **SHEETS** | | | | | | | | | | | | | | | |
| Hot-rolled | 2.425¢ | 2.425¢ | 2.425¢ | 2.425¢ | 2.425¢ | 2.425¢ | 2.425¢ | 2.425¢ | 2.525¢ | 2.425¢ | | 2.975¢ | 2.525¢ | 2.665¢ | 2.595¢ |
| Cold-rolled[1] | 3.275¢ | 3.275¢ | 3.275¢ | 3.275¢ | | 3.275¢ | 3.275¢ | | 3.375¢ | 3.275¢ | | 3.925¢ | 3.375¢ | 3.515¢ | 3.595¢ |
| Galvanized (24 gage) | 4.05¢ | 4.05¢ | 4.05¢ | | 4.05¢ | 4.05¢ | 4.05¢ | 4.05¢ | 4.15¢ | 4.95¢ | | 4.60¢ | | 4.29¢ | 4.22¢ |
| Enameling (20 gage) | 3.80¢ | 3.80¢ | 3.80¢ | 3.80¢ | | | 3.80¢ | | 3.90¢ | 3.80¢ | | 4.45¢ | 3.90¢ | 4.16¢ | 4.12¢ |
| Long ternes[2] | 4.05¢ | 4.05¢ | 4.05¢ | | | | | | | | | 4.80¢ | | 4.41¢ | 4.37¢ |
| **STRIP** | | | | | | | | | | | | | | | |
| Hot-rolled[3] 6 in. and under | 2.45¢ | 2.45¢ | 2.45¢ | 2.45¢ | 2.45¢ | | 2.45¢ | | | 2.45¢ | | 3.10¢ | 2.55¢ | 2.81¢ | 2.77¢ |
| Hot-rolled[3] over 6 in. | 2.35¢ | 2.35¢ | 2.35¢ | 2.35¢ | 2.35¢ | | 2.35¢ | | | 2.35¢ | | 3.00¢ | 2.45¢ | 2.71¢ | 2.67¢ |
| Cold-rolled[4] | 3.05¢ | 3.15¢ | | 3.05¢ | | | 3.05¢ | (Worcester=3.25¢) | | | | | 3.15¢ | 3.41¢ | 3.37¢ |
| Cooperage stock | 2.55¢ | 2.55¢ | | | 2.55¢ | | 2.55¢ | | | | | | | 2.91¢ | |
| Commodity cold-rolled | 3.20¢ | 3.30¢ | | 3.20¢ | | | 3.20¢ | (Worcester=3.60¢) | | | | | 3.30¢ | 3.56¢ | |
| **TINPLATE** | | | | | | | | | | | | | | | |
| Standard cokes, base box | $5.25 | $5.25 | $5.25 | | $5.35 | | | $5.35 | $5.35 | | | | | $5.60[11] | $5.53[11] |
| Electro, box 0.25 lb | $4.60 | $4.60 | $4.60 | | | | | $4.70 | | | | | | | |
| Electro, box 0.50 lb | $4.75 | $4.75 | $4.75 | | | | | $4.85 | $4.85 | | | | | | |
| Electro, box 0.75 lb | $4.90 | | $4.90 | | | | | $5.00 | $5.00 | | | | | | |
| **BLACKPLATE** | | | | | | | | | | | | | | | |
| 29 gage[5] | 3.30¢ | 3.30¢ | 3.30¢ | | | | | 3.40¢ | 3.40¢ | | | | | | 3.57¢ |
| **TERNES, MFG.** | | | | | | | | | | | | | | | |
| Special coated, base box | $4.55 | $4.55 | $4.55 | | | | | $4.65 | $4.65 | | | | | | |
| **BARS** | | | | | | | | | | | | | | | |
| Carbon steel | 2.50¢ | 2.50¢ | 2.90¢ | 2.50¢ | 2.50¢ | 2.50¢ | 2.50¢ | (Duluth=2.60¢) (Provo, Utah=3.20¢) | | | 2.85¢ | 3.15¢ | 2.60¢ | 2.84¢ | 2.82¢ |
| Rail steel[6] | 2.50¢ | 2.50¢ | 2.50¢ | 2.50¢ | 2.50¢ | 2.50¢ | | | | | 2.85¢ | 3.15¢ | | | |
| Reinforcing (billet)[7] | 2.35¢ | 2.35¢ | 2.35¢ | 2.35¢ | 2.35¢ | 2.35¢ | 2.35¢ | 2.35¢ | | | 2.70¢ | 2.75¢ | 2.45¢ | 2.59¢ | 2.67¢ |
| Reinforcing (rail)[7] | 2.35¢ | 2.35¢ | 2.35¢ | 2.35¢ | 2.35¢ | 2.35¢ | 2.35¢ | | | | 2.70¢ | 2.75¢ | 2.45¢ | | 2.57¢ |
| Cold-finished[8] | 3.10¢ | 3.10¢ | 3.10¢ | 3.10¢ | | 3.10¢ | (Detroit=3.15¢) (Toledo=3.25¢) | | | | | | | 3.44¢ | 3.42¢ |
| Alloy, hot-rolled | 2.92¢ | 2.92¢ | | | | 2.92¢ | 2.92¢ | (Bethlehem Massillon, Canton=2.92¢) | | | | | 3.03¢ | | |
| Alloy, cold-drawn | 3.62¢ | 3.62¢ | 3.62¢ | 3.62¢ | | 3.62¢ | | | | | | | 3.73¢ | | |
| **PLATE** | | | | | | | | (Coatesville and Claymont=2.50¢, Provo, Utah=3.20¢) | | | | | | | |
| Carbon steel[13] | 2.50¢ | 2.50¢ | 2.50¢ | 2.50¢ | 2.50¢ | | 2.50¢ | 2.50¢ | | | 2.85¢ | 3.05¢ | 2.72¢ | 2.69¢ | 2.55¢ |
| Floor plates | 3.75¢ | 3.75¢ | | | | | | | | | 4.10¢ | 4.40¢ | | 4.11¢ | 4.07¢ |
| Alloy | 3.79¢ | 3.79¢ | | | (Coatesville=3.79¢) | | | | | | 4.27¢ | 4.49¢ | | 4.00¢ | 3.88¢ |
| **SHAPES** | | | | | | | | | | | | | | | |
| Structural | 2.35¢ | 2.35¢ | 2.35¢ | | 2.35¢ | 2.35¢ | (Bethlehem=2.35¢) | | | | 2.60¢ | 3.00¢ | | 2.52¢ | 2.465¢ |
| **SPRING STEEL, C-R** | | | | | | | | | | | | | | | |
| 0.26 to 0.50 carbon | 2.80¢ | | | 2.80¢ | | | (Worcester=3.20¢) | | | | | | | | |
| 0.51 to 0.75 carbon | 4.30¢ | | | 4.30¢ | | | (Worcester=4.50¢) | | | | | | | | |
| 0.76 to 1.00 carbon | 6.15¢ | | | 6.15¢ | | | (Worcester=6.35¢) | | | | | | | | |
| 1.01 to 1.25 carbon | 8.35¢ | | | 8.35¢ | | | (Worcester=8.55¢) | | | | | | | | |
| **WIRE** [9] | | | | | | | | | | | | | | | |
| Bright [12] | 3.05¢ | 3.05¢ | | 3.05¢ | 3.05¢ | | (Worcester=3.15¢) | | | (Duluth=3.10¢) | | 3.55¢ | | | 3.37¢ |
| Galvanized | Add proper size extra and galvanizing extra to Bright Wire Base | | | | | | | | | | | | | | |
| Spring (high carbon) | 4.00¢ | 4.00¢ | | 4.00¢ | | | (Worcester=4.10¢) | | | | | 4.50¢ | | | 4.32¢ |
| **PILING** | | | | | | | | | | | | | | | |
| Steel sheet | 2.65¢ | 2.65¢ | | | | 2.65¢ | | | | | | 3.20¢ | | | 2.97¢ |

## CORROSION AND HEAT RESISTANT STEELS

In cents per pound, f.o.b. basing point

| BASING POINT | Chromium Nickel | | Straight Chromium | | | |
|---|---|---|---|---|---|---|
| | No. 304 | No. 302 | No. 410 | No. 430 | No. 442 | No. 446 |
| Ingot, P'gh, Chi, Canton, Balt, Reading, Ft. Wayne, Phila. | Subject to negotiation | | | Subject to negotiation | | |
| Blooms, P'gh, Chi, Canton, Phila, Reading, Ft. Wayne, Balt. | 22.99 | 24.67 | 17.01 | 17.47 | 20.69 | 25.29 |
| Slabs, P'gh, Chi, Canton, Balt, Phila, Reading | 22.99 | 24.67 | 17.01 | 17.47 | 20.69 | 25.29 |
| Billets, P'gh, Chi, Canton, Newark, N. J., Watervliet, Syracuse, Balt. | Subject to negotiation | | | Subject to negotiation | | |
| Billets, forging, P'gh, Chi, Canton, Dunkirk, Balt, Phila, Reading, Watervliet, Syracuse, Newark, N. J., Ft. Wayne, Titusville | 22.99 | 24.67 | 17.01 | 17.47 | 20.69 | 25.29 |
| Bars, h-r, P'gh, Chi, Canton, Dunkirk, Watervliet, Newark, N. J., Syracuse, Balt, Phila, Reading, Ft. Wayne, Titusville | 27.05 | 25.97 | 20.02 | 20.56 | 24.34 | 29.75 |
| Bars, c-f, P'gh, Chi, Cleve, Canton, Dunkirk, Newark, N. J., Syracuse, Balt, Phila, Reading, Ft. Wayne, Watervliet | 27.05 | 25.97 | 20.02 | 20.56 | 24.34 | 29.75 |
| Plates, P'gh, Middletown, Canton | 31.38 | 29.21 | 23.28 | 23.80 | 28.67 | 33.00 |
| Shapes, structural, P'gh, Chi | 27.05 | 25.97 | 20.02 | 20.56 | 24.34 | 29.75 |
| Sheets, P'gh, Chi, Middletown, Canton, Balt. | 38.95 | 36.79 | 28.67 | 31.38 | 35.16 | 38.49 |
| Strip, h-r, P'gh, Chi, Reading, Canton, Youngstown | 25.43 | 23.28 | 18.39 | 18.93 | 25.97 | 37.87 |
| Strip, c-r, P'gh, Cleve, Newark, N. J., Reading, Canton, Youngstown | 32.46 | 30.30 | 23.80 | 24.34 | 34.62 | 56.26 |
| Wire, c-d, Cleve, Dunkirk, Syracuse, Balt, Reading, Canton, P'gh, Newark, N. J., Phila. | 27.05 | 25.97 | 20.02 | 20.56 | 24.34 | 29.75 |
| Wire, flat, c-r, Cleve, Balt, Reading, Dunkirk, Canton | 32.46 | 30.30 | 23.80 | 24.34 | 34.62 | 56.26 |
| Rod, h-r, Newark, N. J., Syracuse | 27.05 | 25.97 | 20.02 | 20.56 | 24.34 | 29.75 |
| Tubing, seamless, P'gh, Chi, Canton, (4 in. to 6 in.) | 72.09 | 72.09 | ..... | 68.49 | ..... | ..... |

## SHELL STEEL

| | *per gross ton* |
|---|---|
| 3 in. to 12 in. | $52.00 |
| 12 in. to 18 in. | 54.00 |
| 18 in. and over | 56.00 |

Basic openhearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.

Prices delivered Detroit are $2.00 higher; East Michigan, $3 higher.

Price Exceptions: Follansbee Steel Corp. permitted to sell at $13.00 per gross ton, f.o.b. Toronto, Ohio, above base price of $52.00.

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

## ELECTRICAL SHEETS

*Base, all grades f.o.b. Pittsburgh*

| | *per lb* |
|---|---|
| Field grade | 3.90¢ |
| Armature | 4.25¢ |
| Electrical | 4.75¢ |
| Motor | 5.425¢ |
| Dynamo | 6.125¢ |
| Transformer 72 | 6.625¢ |
| Transformer 65 | 7.625¢ |
| Transformer 58 | 8.125¢ |
| Transformer 52 | 8.925¢ |

F.o.b. Chicago and Gary, field grade through motor; f.o.b. Granite City, add 10¢ per 100 lb on field grade to and including dynamo. Pacific ports add 75¢ per 100 lb on all grades.

## RAILS, TRACK SUPPLIES

*(F.o.b. mill)*

| | |
|---|---|
| Standard rails, heavier than 60 lb No. 1 O.H., net ton | $43.39 |
| Angle splice bars, 100 lb | 2.85 |
| *(F.o.b. basing points)* | *per net ton* |
| Light rails (from billets) | $49.18 |
| Light rails (from rail steel) | 49.18 |
| | *base per lb* |
| Cut spikes | 3.65¢ |
| Screw spikes | 5.55¢ |
| Tie plate, steel | 2.55¢ |
| Tie plates, Pacific Coast | 2.70¢ |
| Track bolts | 4.75¢ |
| Track bolts, heat treated, to railroads | 5.00¢ |
| Track bolts, jobbers discount | 63-5 |

Basing points, light rails, Pittsburgh, Chicago, Birmingham; cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25¢.

## TOOL STEEL

*(F.o.b. Pittsburgh, Bethlehem, Syracuse, Dunkirk. *Also Canton, O.)*

*An increase of 8.2 pct applies to base price and extras*

| | *Base per lb* |
|---|---|
| High speed | 67¢ |
| Straight molybdenum | 54¢ |
| Tungsten-molybdenum | 57½¢ |
| High-carbon-chromium* | 43¢ |
| Oil hardening* | 24¢ |
| Special carbon* | 22¢ |
| Extra carbon* | 18¢ |
| Regular carbon* | 14¢ |

Warehouse prices on and east of Mississippi are 2¢ per lb higher; west of Mississippi 3¢ higher.

## CLAD STEEL

*Base prices, cents per pound*

| | *Plate* | *Sheet* |
|---|---|---|
| Stainless-clad No. 304, 20 pct, f.o.b. Pittsburgh, Washington, Pa. | 21.00* | 22.00 |
| Nickel-clad 10 pct, f.o.b. Coatesville, Pa. | 18.72 | .... |
| Inconel-clad 10 pct, f.o.b. Coatesville | 26.00 | .... |
| Monel-clad 10 pct, f.o.b. Coatesville | 24.96 | .... |
| Aluminized steel Hot dip, 20 gage, f.o.b. Pittsburgh | .... | 9.00 |

*Includes annealing and pickling.

## WIRE PRODUCTS

*To the dealer, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth*

| | *Basing Points Named* | *Pacific Coast Basing Points†* |
|---|---|---|
| | *base per keg* | |
| Standard wire nails | $3.25 | $3.75 |
| Coated nails | 3.25 | 3.75 |
| Cut nails, carloads | 3.85 | .... |
| | *base per 100 lb* | |
| Annealed fence wire | $3.50 | $4.00 |
| Annealed galv. fence wire | 3.85 | 4.35 |
| | *base column* | |
| Woven wire fence* | 72 | 90 |
| Fence posts, carloads | 74 | 91 |
| Single loop bale ties†† | 72 | 97 |
| Galvanized barbed wire** | 79 | 89 |
| Twisted barbless wire | 79 | 89 |

*15½ gage and heavier. **On 80-rod spools in carload quantities.

†Prices subject to switching or transportation charges.

††Add 50c a ton.

## ROOFING TERNEPLATE

*(F.o.b. Pittsburgh, 112 sheets)*

| | 20x14 in. | 20x28 in. |
|---|---|---|
| 8-lb coating I.C. | $8.50 | $17.00 |
| 15-lb coating I.C. | 9.50 | 19.00 |
| 20-lb coating I.C. | 10.00 | 20.00 |

## ALLOY EXTRAS

| Alloy Steel | Basic Openhearth | | Electric Furnace | |
|---|---|---|---|---|
| | Bars and Bar-strip | Billets, Blooms and Slabs | Bars and Bar-strip | Billets, Blooms and Slabs |
| NE 8600 | 0.676¢ | $13.52 | 1.196¢ | $23.92 |
| NE 8700 | 0.728 | 14.56 | 1.248 | 24.96 |
| NE 9400 | 0.780 | 15.60 | 1.300 | 26.00 |
| NE 9700 | 0.676 | 13.52 | 1.196 | 23.92 |
| NE 8300 | 1.352 | 27.04 | 1.872 | 37.44 |
| NE 9900 | 1.248 | 24.96 | 1.612 | 32.24 |

The extras shown are in addition to the base price of $2.92 per 100 lb on finished products and $58.43 per gross ton on semifinished steel, major basing points, as shown in table, opposite page, and are in cents per pound when applicable to bars and bar-strip and in dollars per gross ton when applicable to billets, blooms and slabs. When acid openhearth is specified and acceptable, add to basic openhearth alloy differential 0.27¢ per lb for bars and bar-strip and $5.14 per gross ton for billets, blooms and slabs.

## WELDED PIPE AND TUBING

*Base discounts, f.o.b. Pittsburgh district and Lorain, Ohio, mills*

*(F.o.b. Pittsburgh only on wrought pipe) base price—$200.00 per net ton*

***Steel (buttweld)***

| | Black | Galv. |
|---|---|---|
| ½-in. | 60½ | 48 |
| ¾-in. | 63½ | 52 |
| 1-in. to 3-in. | 65½ | 54½ |

***Wrought Iron (buttweld)***

| | | |
|---|---|---|
| ½-in. | 18 | +4 |
| ¾-in. | 24 | 2½ |
| 1-in. and 1¼-in. | 28½ | 9 |
| 1½-in. | 33 | 12 |
| 2-in. | 32 | 11 |

***Steel (lapweld)***

| | | |
|---|---|---|
| 2-in. | 58 | 46½ |
| 2½-in. and 3-in. | 61 | 49½ |
| 3½-in. to 6-in. | 63 | 51½ |

***Wrought Iron (lapweld)***

| | | |
|---|---|---|
| 2-in. | 25 | 4½ |
| 2½-in. to 3½-in. | 26 | 7 |
| 4-in. | 28 | 11 |
| 4½-in. to 8-in. | 27 | 10 |

***Steel (butt, extra strong, plain ends)***

| | | |
|---|---|---|
| ½-in. | 58½ | 47½ |
| ¾-in. | 62½ | 51½ |
| 1-in. to 3-in. | 64 | 54 |

***Wrought Iron (same as above)***

| | | |
|---|---|---|
| ½-in. | 19 | +1½ |
| ¾-in. | 25 | 4½ |
| 1-in. to 2-in. | 33 | 13 |

***Steel (lap, extra strong, plain ends)***

| | | |
|---|---|---|
| 2-in. | 56 | 45½ |
| 2½-in. and 3-in. | 60 | 49½ |
| 3½-in. to 6-in. | 63½ | 53 |

***Wrought Iron (same as above)***

| | | |
|---|---|---|
| 2-in. | 28 | 8½ |
| 2½-in. to 4-in. | 34 | 16 |
| 4½-in. to 6-in. | 32 | 14½ |

On buttweld and lapweld steel pipe jobbers are granted a discount of 5 pct. On l.c.l. shipments prices are determined by adding 25 pct and 30 pct and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lapweld and one point lower discount, or $2 a ton higher on all buttweld.

## BOILER TUBES

*Seamless steel and lapweld commercial boiler tubes and locomotive tubes, minimum wall. Net base prices per 100 ft f.o.b. Pittsburgh, in carload lots*

| | Seamless Cold-Drawn | Seamless Hot-Rolled | Lapweld, Hot-Rolled |
|---|---|---|---|
| 2 in. O.D. | 13 B.W.G. 16.52 | 13.90 | 13.20 |
| 2½ in. O.D. | 12 B.W.G. 22.21 | 18.70 | 17.67 |
| 3 in. O.D. | 12 B.W.G. 24.71 | 20.79 | 19.56 |
| 3½ in. O.D. | 11 B.W.G. 31.18 | 26.25 | 24.68 |
| 4 in. O.D. | 10 B.W.G. 38.68 | 32.56 | 30.55 |

*(Extras for less carload quantities)*

| | |
|---|---|
| 40,000 lb or ft and over | Base |
| 30,000 lb or ft to 39,999 lb or ft | 5 pct |
| 20,000 lb or ft to 29,999 lb or ft | 10 pct |
| 10,000 lb or ft to 19,999 lb or ft | 20 pct |
| 5,000 lb or ft to 9,999 lb or ft | 30 pct |
| 2,000 lb or ft or 4,999 lb or ft | 45 pct |
| Under 2,000 lb or ft | 65 pct |

## CAST IRON WATER PIPE

| | Per Net Ton |
|---|---|
| 6-in. and larger, del'd Chicago | $60.80 |
| 6-in. and larger, del'd New York | 60.20 |
| 6-in. and larger, Birmingham | 52.00 |
| 6-in. and larger, f.o.b. cars, San Francisco, Los Angeles or Seattle | 74.00 |

For all rail shipment; rail and water shipment less.

Class "A" and gas pipe, $3 extra; 4-in. pipe is $5 a ton above 6-in.

## BOLTS, NUTS, RIVETS, SET SCREWS

**An increase of 7 pct applies to all listings.**

***Bolts and Nuts***

*(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)*

**Machine and Carriage Bolts**

*Base discount less case lots*

| | Percent Off List |
|---|---|
| ½ in. & smaller x 6 in. & shorter | 65½ |
| 9/16 & ⅝ in. x 6 in. & shorter | 63½ |
| ¾ to 1 in. x 6 in. & shorter | 61 |
| 1⅛ in. and larger, all lengths | 59 |
| All diameters over 6 in. long | 59 |
| Lag, all sizes | 62 |
| Plow bolts | 65 |

**Nuts, Cold Punched or Hot Pressed**

*(Hexagon or Square)*

| | |
|---|---|
| ½ in. and smaller | 62 |
| 9/16 to 1 in. inclusive | 59 |
| 1⅛ to 1½ in. inclusive | 57 |
| 1⅝ in. and larger | 56 |

On above bolts and nuts, excepting plow bolts, additional allowance of 10 pct for full container quantities. There is an additional 5 pct allowance for carload shipments.

| Semifin. Hexagon Nuts | U.S.S. | S.A.E. |
|---|---|---|
| *Base discount less keg lots* | | |
| 7/16 in. and smaller | .. | 64 |
| ½ in. and smaller | 62 | .. |
| ⅝ in. through 1 in. | | 60 |
| 9/16 in. through 1 in. | 59 | .. |
| 1⅛ in. through 1½ in. | 57 | 58 |
| 1⅝ in. and larger | 56 | .. |

In full keg lots, 10 pct additional discount.

***Stove Bolts***

| | Consumer |
|---|---|
| Packages, nuts loose | 71 and 10 |
| In packages | 71 |
| In bulk | 80 |

On stove bolts freight allowed up to 65¢ per 100 lb based on Cleveland, Chicago, New York on lots of 200 lb or over.

***Large Rivets***
***(½ in. and larger)***

| | Base per 100 Lb |
|---|---|
| F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham | $3.75 |

***Small Rivets***
***(7/16 in. and smaller)***

| | Percent Off List |
|---|---|
| F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham | 65 and 5 |

| ***Cap and Set Screws*** | Percent Off List Consumer |
|---|---|
| Upset full fin, hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in. | 64 |
| Upset set screws, cup and oval points | 71 |
| Milled studs | 46 |
| Flat head cap screws, listed sizes | 36 |
| Fillister head cap, listed sizes | 51 |

Freight allowed up to 65¢ per 100 lb based on Cleveland, Chicago or New York on lots of 200 lb or over.

## FLUORSPAR

Maximum price f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

***Exception***

When the WPB Steel Div. certifies in writing the consumers need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

| Effective $CaF_2$ Content: | Base price per short ton |
|---|---|
| 70% or more | $33.00 |
| 65% but less than 70% | 32.00 |
| 60% but less than 65% | 31.00 |
| Less than 60% | 30.00 |

## LAKE SUPERIOR ORES

(51.50% *Fe, Natural Content, Delivered Lower Lake Ports**)

| | Per Gross Ton |
|---|---|
| Old range, bessemer, 51.50 | $4.95 |
| Old range, non-bessemer, 51.50 | 4.80 |
| Mesaba, bessemer, 51.50 | 4.70 |
| Mesaba, non-bessemer, 51.50 | 4.55 |
| High phosphorus, 51.50 | 4.35 |

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

## METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. F.o.b. shipping point, cents per lb, ton lots.

| | |
|---|---|
| Brass, minus 100 mesh | 18.5¢ to 20.25¢ |
| Copper, electrolytic, 150 and 200 mesh | 21½¢ to 23½¢ |
| Copper, reduced, 150 and 200 mesh | 20½¢ to 25½¢ |
| Iron, commercial, 100, 200, 325, mesh 96 + % Fe | 11¢ to 16¢ |
| Iron, crushed, 200 mesh and finer, 90 + % Fe carload lots | 4¢ |
| Iron, hydrogen reduced, 300 mesh and finer, 98½ + % Fe, drum lots | 63¢ |
| Iron, electrolytic, unannealed, 325 mesh and coarser, 99 + % Fe | 27¢ to 42¢ |
| Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe | 31¢ |
| Iron carbonyl, 300 mesh and finer, 98-99.8 + % Fe | 90¢ |
| Aluminum, 100 and 200 mesh | *25¢ |
| Antimony, 100 mesh | 30¢ |
| Cadmium, 100 mesh | $1.40 |
| Chromium, 100 mesh and finer | $1.25 |
| Lead, 100, 200 & 300 mesh | 11½ to 15¢ |
| Manganese, minus 325 mesh and coarser | 44¢ to 61¢ |
| Nickel, 150 mesh | 51½¢ |
| Silicon, minus 325 mesh and coarser | 26¢ to 55¢ |
| Solder powder, 100 mesh | 8½¢ plus metal |
| Tin, 100 mesh | 58¾¢ |
| Tungsten metal powder, 98%-99%, any quantity, per lb | $2.60 |
| Molybdenum powder, 99%, in 200-lb kegs, f.o.b. York, Pa., per lb | $2.60 |
| Under 100 lb | $3.00 |

*Freight allowed east of Mississippi.

## COKE

| | Net Ton |
|---|---|
| **Furnace, beehive (f.o.b. oven)** | |
| Connellsville, Pa. | $7.50* |
| **Foundry, beehive (f.o.b. oven)** | |
| Fayette Co., W. Va. | 8.10 |
| Connellsville, Pa. | 9.00 |
| **Foundry, Byproduct** | |
| Chicago, del'd | 13.75 |
| Chicago, f.o.b. | 13.00 |
| New England, deld | 14.65 |
| Kearny, N. J., f.o.b. | 13.05 |
| Philadelphia, del'd | 13.28 |
| Buffalo, del'd | 13.40 |
| Portsmouth, Ohio, f.o.b. | 11.50 |
| Painesville, Ohio, f.o.b. | 12.15 |
| Erie, del'd | 13.15 |
| Cleveland, del'd | 13.20 |
| Cincinnati, del'd | 13.25 |
| St. Louis, del'd | 13.75† |
| Birmingham, del'd | 10.90 |

*Hand drawn ovens using trucked coal permitted to charge $8.60 per ton plus transportation charges.

†Except producers situated in states other than Missouri, Alabama or Tennessee, sellers may charge a maximum delivered price of $14.25 in the St. Louis Mo., and East St. Louis, Ill., switching districts.

## REFRACTORIES

*(F.o.b. Works)*

***Fire Clay Brick****

| | Per 1000 |
|---|---|
| Super-Duty brick, St. Louis | $76.05 |
| First quality, Pa., Md., Ky., Mo., Ill. | 60.40 |
| First quality, New Jersey | 65.90 |
| Sec. quality, Pa., Md., Ky., Mo., Ill. | 54.80 |
| Sec. quality, New Jersey | 57.70 |
| No. 1 Ohio | 50.00 |
| Ground fire clay, net ton | 8.95 |

***Silica Brick****

| | |
|---|---|
| Pennsylvania and Birmingham | $60.40 |
| Chicago District | 69.30 |
| Silica cement, net ton (Eastern) | 10.00 |

| ***Chrome Brick*** | Per Net Ton |
|---|---|
| Standard chemically bonded, Balt., Plymouth Meeting, Chester | $54.00 |

***Magnesite Brick***

| | |
|---|---|
| Standard, Balt. and Chester | $76.00 |
| Chemically bonded, Baltimore | 65.00 |

***Grain Magnesite***

| | |
|---|---|
| Domestic, f.o.b. Balt. and Chester in sacks (carloads) | $43.48 |
| Domestic, f.o.b. Chewelah, Wash. in bulk | 22.00 |
| in sacks | 26.00 |

*Retroactive to Apr. 1.

## WAREHOUSE PRICES

*Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendment to OPA Price Schedule 49.*

| Cities | SHEETS | | | STRIP | | | Plates ¼ in. and heavier | Structural Shapes | BARS | | ALLOY BARS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Hot-Rolled | | | | | | | | | | |
| | Hot Rolled (10 gage) | Cold Rolled | Galvanized (24 gage) | 6 in. and Under | Over 6 in. | Cold Rolled | | | Hot Rolled | Cold Finished | Hot Rolled, NE 8617-20 | Hot Rolled, NE 8742-50 Ann. | Cold Drawn, NE 8617-20 | Cold Drawn, NE 8742-50 Ann. |
| **Philadelphia | $3.743 | $5.097 | $5.218a | $4.272 | $4.172 | $5.022 | $3.855 | $3.916 | $4.072 | $4.522 | $6.016 | $7.218 | $7.372 | $8.522 |
| New York | 3.815 | 4.838[3] | 5.46 | 4.324 | 4.224 | 5.024 | 4.018 | 4.008 | 4.103 | 4.553 | 6.058 | 7.158 | 7.403 | 8.453 |
| Boston | 3.999 | 4.969[9] | 5.674 | 4.456 | 4.356 | 4.965 | 4.162 | 4.162 | 4.294 | 4.594 | 6.212 | 7.312 | 7.444 | 8.494 |
| Baltimore | 3.619 | 5.077 | 5.344 | 4.252 | 4.152 | .... | 3.844 | 4.009 | 4.052 | 4.502 | .... | .... | .... | .... |
| Norfolk | 3.996 | .... | 5.821 | 4.515 | 4.415 | .... | 4.221 | 4.252 | 4.315 | 4.615 | .... | .... | .... | .... |
| Chicago | 3.475 | 4.425 | 5.581 | 3.95 | 3.85 | 4.90[17] | 3.80 | 3.80 | 3.75 | 4.20 | .... | .... | .... | .... |
| Milwaukee | 3.612 | 4.562[3] | 5.537 | 4.087 | 4.077 | 5.037[17] | 3.937 | 3.937 | 3.887 | 4.337 | 6.037 | 7.037 | 7.187 | 8.237 |
| Cleveland | 3.575 | 4.625 | 5.327 | 3.95 | 3.85 | 4.70[17] | 3.65 | 3.838 | 3.60 | 4.20 | 6.006 | .... | 6.95 | .... |
| Buffalo | 3.575 | 4.625 | 5.104/5.20 | 4.169 | 4.069 | 4.919 | 3.88 | 3.65 | 3.60 | 4.20 | 5.80 | 6.90 | 7.95 | 8.00 |
| Detroit | 3.675 | 4.725 | 5.45 | 4.05 | 3.95 | .... | 3.859 | 3.911 | 3.70 | 4.25 | 6.13 | .... | 7.259 | .... |
| Cincinnati | 3.65 | 4.70[3] | 5.275 | 4.025 | 3.925 | 4.961 | 3.911 | 3.941 | 3.861 | 4.461 | 6.15 | .... | 7.311 | .... |
| St. Louis | 3.622 | 4.572[3] | 5.581 | 4.097 | 3.997 | 5.181[17] | 3.947 | 3.947 | 3.897 | 4.481 | 6.181 | .... | 7.331 | .... |
| Pittsburgh | 3.575 | 4.625 | 5.20 | 3.95 | 3.85 | .... | 3.65 | 3.65 | 3.60 | 4.20 | .... | .... | .... | .... |
| St. Paul | 3.797 | 4.747 | 5.635 | 4.272 | 4.172 | 5.352 | 4.122 | 4.122 | 4.072 | 4.811 | .... | .... | .... | .... |
| Omaha | 4.018 | 5.668 | 5.965 | 4.343 | 4.243 | .... | 4.343 | .... | 4.293 | 4.893 | .... | .... | .... | .... |
| Indianapolis | 3.745 | 4.795 | 5.37 | 4.12 | 4.02 | 4.99 | 3.88 | 3.88 | 3.83 | 4.43 | 6.13 | .... | 7.28 | .... |
| Birmingham | 3.675 | .... | 5.20 | .... | .... | .... | 3.80 | 3.80 | 3.75 | 4.903 | .... | .... | .... | .... |
| Memphis | 4.19 | 4.885 | 5.715 | 4.565 | 4.465 | .... | 4.315 | 4.315 | 4.265 | 4.78 | .... | .... | .... | .... |
| New Orleans | 4.283* | 5.304 | 5.808 | 4.658 | 4.558 | .... | 4.408 | 4.408* | 4.358* | 5.079 | .... | .... | .... | .... |
| Houston | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Los Angeles | 4.70/5.00 | 6.80/7.20[3] | 6.55 | 4.95 | 4.85 | .... | 4.60/4.95 | 4.45/4.65 | 4.40/4.55 | 5.683/6.03 | .... | .... | .... | .... |
| San Francisco | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| Seattle | 4.87[12] | 7.27[4] | 6.40 | 4.80 | 4.50 | .... | 5.00[12] | 4.70[12] | 4.60[12] | 6.23 | .... | .... | .... | .... |
| Portland | 4.87[11] | 6.82[4] | 6.20 | 5.10 | 5.00 | .... | 5.00[11] | 4.70[11] | 4.70[11] | 5.98 | 6.15 | .... | 9.20 | .... |
| Salt Lake City | 4.75 | .... | 6.62[18] | 5.88 | 5.78 | .... | 5.23[18] | 5.23[18] | 5.13 | 6.35 | .... | .... | .... | .... |

### BASE QUANTITIES

*Standard unless otherwise keyed on prices.*

**HOT-ROLLED:** Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

**COLD-ROLLED:** Sheets, 400 to 1499 lb; strip, extras on all quantities; bars, 1500 lb base.

**NE ALLOY BARS:** 1000 to 39,999 lb.

**GALVANIZED SHEETS:** 450 to 1499 lb.

**EXCEPTIONS:** (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 199 lb. (7) 400 to 1499 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 300 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb and over. (15) 1000 lb and over. (16) 1500 lb and over. (17) 2000 lb and over. (18) 3500 lb and over.

(a) Philadelphia: Galvanized sheet, 25 or more bundles.

Extra for size, quality, etc., apply on above quotations.

* Add 0.271¢ for sizes not rolled in Birmingham.

** City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

## PIG IRON PRICES

Maximum per gross ton, effective Mar. 15, 1946.
Prices do not reflect 3 pct tax on freight.

**BASING POINT PRICES**

| Basing Point | Basic | No. 2 Foundry | Malleable | Bessemer | Low Phos. |
|---|---|---|---|---|---|
| Bethlehem | 27.00 | 27.50 | 28.00 | 28.50 | .... |
| Birdsboro | 27.00 | 27.50 | 28.00 | 28.50 | 32.00 |
| Birmingham | 21.50 | 22.88 | .... | 27.50 | .... |
| Buffalo | 25.50 | 26.50 | 27.00 | 27.50 | 32.00 |
| Chicago | 26.00 | 26.50 | 26.50 | 27.00 | ..... |
| Cleveland | 26.00 | 26.50 | 26.50 | 27.00 | ..... |
| Detroit | 26.00 | 26.50 | 26.50 | 27.00 | ..... |
| Duluth | 26.50 | 27.00 | 27.00 | 27.50 | ..... |
| Erie | 26.00 | 26.50 | 27.00 | 27.50 | ..... |
| Everett | 27.00 | 27.50 | 28.00 | 28.50 | ..... |
| Granite City | 26.00 | 26.50 | 26.50 | 27.00 | ..... |
| Hamilton | 26.00 | 26.50 | 26.50 | .... | ..... |
| Neville Island | 26.00 | 26.50 | 26.50 | 27.00 | ..... |
| Provo | 24.00 | 24.50 | .... | .... | ..... |
| Sharpsville[1] | 26.00 | 26.00 | 26.50 | 27.00 | ..... |
| Sparrows Point | 27.00 | 27.50 | ..... | ..... | ..... |
| Steelton | 27.00 | .... | ..... | ..... | 32.00 |
| Swedeland | 27.00 | 27.50 | 28.00 | 28.50 | ..... |
| Toledo | 26.00 | 26.50 | 26.50 | 27.00 | ..... |
| Youngstown | 26.00 | 26.50 | 26.50 | 27.00 | ..... |

**DELIVERED PRICES (BASE GRADES)**

| Consuming Point | Basing Point | Freight Rate | Basic | No. 2 Foundry | Malleable | Bessemer | Low Phos. |
|---|---|---|---|---|---|---|---|
| Boston | Everett | 0.50 | 27.50 | 28.00 | 28.50 | 29.00 | .... |
| Boston | Birdsboro-Steelton | 4.02 | ..... | ..... | ..... | ..... | 38.02 |
| Brooklyn | Bethlehem | 2.50 | 29.50 | 30.00 | 30.50 | 31.00 | .... |
| Brooklyn | Birdsboro | 2.92 | ..... | ..... | ..... | ..... | 34.92 |
| Canton | Clev, Ygstn, Sharpsvil. | 1.39 | 27.39 | 27.89 | 27.89 | 28.39 | .... |
| Canton | Buffalo | 3.19 | ..... | ..... | ..... | ..... | 35.10 |
| Cincinnati | Birmingham | 4.06 | 25.56 | 26.94 | ..... | ..... | ..... |
| Cincinnati | Hamilton | 1.11 | ..... | ..... | 27.61 | ..... | ..... |
| Cincinnati | Buffalo | 4.40 | ..... | ..... | ..... | ..... | 36.40 |
| Jersey City | Bethlehem | 1.53 | 28.53 | 29.03 | 29.53 | 30.03 | .... |
| Jersey City | Birdsboro | 1.94 | ..... | ..... | ..... | ..... | 33.94 |
| Los Angeles | Provo | 4.95 | 28.95 | 29.45 | ..... | ..... | ..... |
| Los Angeles | Buffalo | 15.41 | ..... | ..... | ..... | ..... | 47.41 |
| Mansfield | Cleveland-Toledo | 1.94 | 27.94 | 28.44 | 28.44 | 28.94 | .... |
| Mansfield | Buffalo | 3.36 | ..... | ..... | ..... | ..... | 35.38 |
| Philadelphia | Swedeland | 0.84 | 27.84 | 28.34 | 28.84 | 29.34 | .... |
| Philadelphia | Birdsboro | 1.24 | ..... | ..... | ..... | ..... | 33.24 |
| San Francisco | Provo | 4.95 | 28.95 | 29.45 | ..... | ..... | ..... |
| San Francisco | Buffalo | 15.41 | ..... | ..... | ..... | ..... | 47.41 |
| Seattle | Provo | 4.95 | 28.95 | 29.45 | ..... | ..... | ..... |
| Seattle | Buffalo | 15.41 | ..... | ..... | ..... | ..... | 47.41 |
| St. Louis | Granite City | 0.50 | 26.50 | 27.00 | 27.00 | 27.50 | .... |
| St. Louis | Buffalo | 7.07 | ..... | ..... | ..... | ..... | 39.07 |

(1) Struthers Iron & Steel Co., Struthers, Ohio, may charge 50¢ per ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable.

Charcoal pig iron base prices for Lyles, Tenn., and Lake Superior furnaces, $33.00 and $34.00, respectively. Newberry Brand of Lake Superior charcoal iron $39.00 per g.t., f.o.b. furnace, by order L 39 to RPS 10. Apr. 11, 1945, retroactive to Mar. 7, 1945. Delivered to Chicago, $42.34. High phosphorus iron sells at Lyles, Tenn., at $28.50.

Basing point prices are subject to switching charges; silicon differentials (not to exceed 50¢ per ton for each 0.25 pct silicon content in excess of base grade which is 1.75 to 2.25 pct); phosphorus differentials, a reduction of 38¢ per ton for phosphorous content of 0.70 pct and over; manganese differentials, a charge not to exceed 50¢ per ton for each 0.50 pct manganese content in excess of 1.00 pct. Effective Mar. 3, 1943, $2 per ton extra may be charged for 0.5 to 0.75 pct nickel content and $1 per ton extra for each additional 0.25 pct nickel.

Silvery iron and bessemer ferrosilicon up to and including 14.00 pct silicon covered by RPS 10 as amended. Silvery iron, silicon 6.00 to 6.50 pct, C/L per g.t., f.o.b. Jackson, Ohio—$32.00; f.o.b. Buffalo—$33.25. Add $1.00 per ton for each additional 0.50 pct Si. Add 50¢ per ton for each 0.50 pct Mn over 1.00 pct. Add $1.00 per ton for prices of comparable analysis.

### *Ferromanganese*

78-82% Mn, maximum contract base price, gross ton, lump size, f.o.b. Baltimore, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.

| | |
|---|---|
| Carload lots (bulk) | $135.00 |
| Less ton lots (packed) | 148.50 |
| F.o.b. Pittsburgh | 139.50 |

$1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Briquets—per pound of briquet, freight allowed, 66% contained Mn.

| | Eastern | Central | Western |
|---|---|---|---|
| Carload, bulk | 6.05¢ | 6.30¢ | 6.60¢ |
| Ton lots | 6.65¢ | 7.55¢ | 8.55¢ |
| Less ton lots | 6.80¢ | 7.80¢ | 8.80¢ |

### *Spiegeleisen*

Contract prices, gross ton, lump, f.o.b. Palmerton, Pa.

| | 16-19% Mn 3% max. Si | 19-21% Mn 3% max. Si |
|---|---|---|
| Carloads | $35.00 | $36.00 |
| Less ton | 47.50 | 48.50 |
| F.o.b. Pittsburgh, Chicago | 40.00 | |

### *Manganese Metal*

Contract basis, lump size, per pound of metal, f.o.b. shipping point, freight allowed.

96-98% Mn, 0.2% max. C, 1% max. Si, 2% max. Fe.

| | |
|---|---|
| Carload, bulk | 30¢ |
| L.c.l. lots | 32¢ |

### *Electrolytic Manganese*

F.o.b. Knoxville, Tenn., freight allowed east of Mississippi, cents per pound.

| | |
|---|---|
| Carloads | 32¢ |
| Ton lots | 34¢ |
| Less ton lots | 36¢ |

### *Low-Carbon Ferromanganese*

Contract price per pound Mn contained, lump size, f.o.b. shipping point, freight allowed, eastern zone.

| | Carloads | Ton | Less |
|---|---|---|---|
| 0.10 max. C, 0.06% P, 90% Mn | 21.00¢ | 21.40¢ | 21.65¢ |
| 0.10% max. C | 20.50¢ | 20.90¢ | 21.15¢ |
| 0.15% max. C | 20.00¢ | 20.40¢ | 20.65¢ |
| 0.30% max. C | 19.50¢ | 19.90¢ | 20.15¢ |
| 0.50% max. C | 19.00¢ | 19.40¢ | 19.65¢ |
| 0.75% max. C, 7.00% max. Si | 16.00¢ | 16.40¢ | 16.65¢ |

### *Silicomanganese*

Contract basis, lump size, per pound of metal, f.o.b. shipping point, freight allowed. 65-70% Mn, 17-20% Si, 1.5% max. C.

| | |
|---|---|
| Carload, bulk | 6.05¢ |
| Ton lots | 6.70¢ |
| Briquet, contract basis, carlots, bulk, freight allowed, per lb of briquet | 5.80¢ |
| Ton lots | 6.30¢ |
| Less ton lots | 6.55¢ |

### *Silvery Iron (electric furnace)*

Si 14.01 to 14.50%, $48.75 f.o.b. Keokuk, Iowa; $46.75 f.o.b. Niagara Falls. Add $1.00 per ton for each additional 0.50% Si up to and including 18%. Add $1.00 per ton for low impurities, not to exceed: P—0.05%, S—0.04%, C—1.00%. Covered by MPR 405.

### *Silicon Metal*

Contract price per pound contained Si, lump size, f.o.b. shipping point, freight allowed, for ton lots, packed.

| | Eastern | Central | Western |
|---|---|---|---|
| 96% Si, 2% Fe | 13.10¢ | 13.55¢ | 16.50¢ |
| 97% Si, 1% Fe | 13.45¢ | 13.90¢ | 16.80¢ |

### *Ferrosilicon Briquets*

Contract price per pound of briquet, bulk, f.o.b. shipping point, freight allowed to destination. 40% Si.

| | Eastern | Central | Western |
|---|---|---|---|
| Carload, bulk | 3.35¢ | 3.50¢ | 3.65¢ |
| Ton lots | 3.80¢ | 4.20¢ | 4.25¢ |

### *Electric Ferrosilicon*

Contract price per pound contained Si, lump size in carloads, f.o.b. shipping point, freight allowed.

| | Eastern | Central | Western |
|---|---|---|---|
| 50% Si | 6.65¢ | 7.10¢ | 7.25¢ |
| 75% Si | 8.05¢ | 8.20¢ | 8.75¢ |
| 80-90% Si | 8.90¢ | 9.05¢ | 9.55¢ |
| 90-95% Si | 11.05¢ | 11.20¢ | 11.65¢ |

### *Ferrochrome* (65-72% *Cr*, 2% *max. Si*)

Contract prices per pound, contained Cr, lump size in carloads, f.o.b. shipping point, freight allowed.

| | Eastern | Central | Western |
|---|---|---|---|
| 0.06% C | 23.00¢ | 23.40¢ | 24.00¢ |
| 0.10% C | 22.50¢ | 22.90¢ | 23.50¢ |
| 0.15% C | 22.00¢ | 22.40¢ | 23.00¢ |
| 0.20% C | 21.50¢ | 21.90¢ | 22.50¢ |
| 0.50% C | 21.00¢ | 21.40¢ | 22.00¢ |
| 1.00% C | 20.50¢ | 20.90¢ | 21.50¢ |
| 2.00% C | 19.50¢ | 19.90¢ | 20.50¢ |
| 66-71% Cr, 4-10% C | 13.00¢ | 13.40¢ | 14.00¢ |
| 62-66% Cr, 5-7% C | 13.50¢ | 13.90¢ | 14.50¢ |

Briquets—contract price per pound of briquet, f.o.b. shipping point, freight allowed. 60% chromium.

| | Eastern | Central | Western |
|---|---|---|---|
| Carload, bulk | 8.25¢ | 8.55¢ | 8.95¢ |
| Ton lots | 8.75¢ | 9.25¢ | 10.75¢ |
| Less ton lots | 9.00¢ | 9.50¢ | 11.00¢ |

### *High-Nitrogen Ferrochrome*

Low-carbon type: 67-72% Cr, 0.75% N. Add 2¢ per lb to regular low-carbon ferrochrome price schedule. Add 2¢ for each additional 0.25% N. High-carbon type: 66.71% Cr, 4-5% C, 0.75% N. Add 5¢ per lb to regular high-carbon ferrochrome price schedule.

### *S. M. Ferrochrome*

Contract price per pound chromium contained, lump size, f.o.b. shipping point, freight allowed.

High carbon type: 60-65% Cr, 4-6% Si, 4-6% Mn, 4-6% C.

| | Eastern | Central | Western |
|---|---|---|---|
| Carload | 14.00 | 14.40 | 15.00 |
| Ton lots | 14.00 | 15.55 | 16.75 |
| Less ton lots | 15.40 | 16.05 | 17.25 |

Low carbon type: 62-66% Cr, 4-6% Si, 4-6% Mn, 1.25% max. C.

| | Eastern | Central | Western |
|---|---|---|---|
| Carload | 20.00 | 20.40 | 21.00 |
| Ton lots | 21.00 | 21.65 | 22.85 |
| Less ton lots | 22.00 | 22.65 | 23.85 |

### *Chromium Metal*

Contract prices per pound, chromium contained, carload, f.o.b. shipping point, freight allowed. 97% min. Cr, 1% max. Fe.

| | Eastern | Central | Western |
|---|---|---|---|
| 0.20% max. C | 83.50 | 85.00 | 86.25 |
| 0.50% max. C | 79.50 | 81.00 | 82.25 |
| 9.00% min. C | 79.50 | 81.00 | 82.25 |

### *Chromium—Copper*

Contract price per pound of alloy, f.o.b. Niagara Falls, freight allowed east of the Mississippi. 8-11% Cr, 88-90% Cu, 1.00% max. Fe, 0.50% max. Si.

| | |
|---|---|
| Shot or ingot | 45¢ |

### *Calcium—Silicon*

Contract price per lb of alloy, lump, f.o.b. shipping point, freight allowed.

30-35% Ca, 60-65% Si, 3.00% max. Fe or 28-32% Ca, 60-65% Si, 6.00% max. Fe.

| | Eastern | Central | Western |
|---|---|---|---|
| Carloads | 13.00 | 13.50 | 15.55 |
| Ton lots | 14.50 | 15.25 | 17.40 |
| Less ton lots | 15.50 | 16.25 | 18.40 |

### *Calcium—Manganese—Silicon*

Contract prices per pound of alloy, lump, f.o.b. shipping point, freight allowed.

16-20% Ca, 14-18% Mn, 53-59% Si.

| | Eastern | Central | Western |
|---|---|---|---|
| Carloads | 15.50¢ | 16.00¢ | 18.05¢ |
| Ton lots | 16.50¢ | 17.35¢ | 19.10¢ |
| Less ton lots | 17.00¢ | 17.85¢ | 19.60¢ |

### *Calcium Metal*

Eastern zone contract prices per pound of metal, f.o.b. shipping point, freight allowed. Add 1¢ for central zone; 5¢ for western zone.

| | Cast | Turnings | Distilled |
|---|---|---|---|
| Ton lots | $1.35 | $1.75 | $4.25 |
| Less ton lots | 1.60 | 2.00 | 5.00 |

### *CMSZ*

Contract price per pound of alloy, f.o.b. shipping point, freight allowed.

Alloy 4: 45-49% Cr, 4-6% Mn, 18-21% Si, 1.25-1.75% Zr, 3.00-4.5% C.

| | Eastern | Central | Western |
|---|---|---|---|
| Ton lots | 12.00¢ | 12.75¢ | 14.75¢ |
| Less ton lots | 12.50¢ | 13.25¢ | 15.25¢ |

Alloy 5: 50-56% Cr, 4-6% Mn, 13-50-16.00% Si, 0.75 to 1.25% Zr, 3.50-5.00% C.

| | Eastern | Central | Western |
|---|---|---|---|
| Ton lots | 11.75¢ | 12.50¢ | 14.50¢ |
| Less ton lots | 12.25¢ | 13.00¢ | 15.00¢ |

### *SMZ*

Contract price per pound of alloy, f.o.b. shipping point, freight allowed. 60-65% Si, 5-7% Mn, 5-7% Zr, 20% Fe.

| | Eastern | Central | Western |
|---|---|---|---|
| Ton lots | 12.00¢ | 12.85¢ | 14.60¢ |
| Less ton lots | 12.50¢ | 13.35¢ | 15.10¢ |

### *Other Ferroalloys*

| | |
|---|---|
| Ferrotungsten, standard, lump or ¼X down, packed, f.o.b. plant Niagara Falls, Washington, Pa., York, Pa., per pound contained T, 5 ton lots, freight allowed | $1.88 |
| Ferrovanadium, 35-55%, contract basis, f.o.b. plant, freight allowances, per pound contained V. | |
| Openhearth | $2.70 |
| Crucible | $2.80 |
| High speed steel (Primos) | $2.90 |
| Vanadium pentoxide, 88-92% $V_2O_5$ technical grade, contract basis, per pound contained $V_2O_5$ | $1.10 |
| Ferrocolumbium, 50-60%, contract basis, f.o.b. plant, freight allowed, per pound contained Cb. | |
| Ton lots | $2.25 |
| Less ton lots | $2.30 |
| Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., per pound contained Mo | 95¢ |
| Calcium molybdate, 40-45¢, f.o.b. Langeloth, Washington, Pa., per pound contained Mo | 80¢ |
| Molybdenum oxide briquets, 48-52% Mo, f.o.b. Langeloth, Pa., per pound contained Mo | 80¢ |
| Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per pound contained Mo | 80¢ |
| Ferrotitanium, 40-45%, 0.10%C max., f.o.b. Niagara Falls, N. Y., ton lots, per pound contained Ti | $1.23 |
| Less ton lots | $1.25 |
| Ferrotitanium, 20-25%, 0.10%C max., ton lots, per pound contained Ti | $1.35 |
| Less ton lots | $1.40 |
| High-carbon ferrotitanium, 15-20%, 6-8% C, contract basis, f.o.b. Niagara Falls, freight allowed, carloads | $142.50 |
| Ferrophosphorus, 18%, electric or blast furnaces, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equalled with Rockdale, Tenn., per gross ton | $58.50 |
| Ferrophosphorus, Electrolytic, 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton | $75.00 |
| Zirconium, 35-40%, contract basis, f.o.b. plant, freight allowed, per pound of alloy. | |
| Carloads lots | 14¢ |
| Zirconium, 12-15%, contract basis, lump, f.o.b. plant, freight allowed, per pound of alloy | |
| Carload, bulk | 4.60¢ |
| Alsifer, 20% Al, 40% Si, 40% Fe, contract basis, f.o.b. Niagara Falls, carload | 5.75¢ |
| Ton lots | 7.25¢ |
| Simanal, 20% Si, 20% Mn, 20% Al, contract basis, f.o.b. Philo, Ohio, freight allowed, per pound | |
| Car lots | 8.00¢ |
| Ton lots | 8.75¢ |
| Less ton lots | 9.25¢ |

### *Boron Agents*

Contract prices per pound of alloy, f.o.b. shipping point, freight allowed. Ferroboron, 17.50% min. B, 1.50% max. Si, 0.50% max. Al, 0.50% max. C.

| | Eastern | Central | Western |
|---|---|---|---|
| Less ton lots | $1.30 | $1.3075 | $1.329 |

*Manganese—Boron* 75.00% Mn, 15-20% B, 5% max. Fe, 1.50% max. Si, 3.00% max. C.

| | | | |
|---|---|---|---|
| Ton lots | $1.89 | $1.903 | $1.935 |
| Less ton lots | 2.01 | 2.023 | 2.055 |

*Nickel—Boron* 15-18% B, 1.00% max. Al, 1.50% max. Si, 0.50% max. C, 3.00% max. Fe, balance Ni.

| | | |
|---|---|---|
| Less ton lots | $2.10 | $2.1125 $2.1445 |

| | |
|---|---|
| Silcaz No. 3, contract basis, f.o.b. plant, freight allowed, per pound of alloy. | |
| Carload lots | 25¢ |
| Ton lots | 26¢ |
| Silvaz No. 3, contract basis, f.o.b. plant, freight allowed, per pound of alloy. | |
| Carload lots | 58¢ |
| Ton lots | 59¢ |
| Grainal, f.o.b. Bridgeville, Pa., freight allowed, 50 lb and over. | |
| No. 1 | 87.5¢ |
| No. 6 | 60¢ |
| No. 79 | 45¢ |
| Bortram, f.o.b. Niagara Falls | |
| Ton lots, per pound | 45¢ |
| Less ton lots, per pound | 50¢ |

## C-I Gives Benefits Of New Steel Composition Patent to Public Use

*Pittsburgh*

• • • **All patent rights** to the use of a "stabilized" steel composition designed to meet requirements of increasingly high temperatures in the steam lines of power plants and in the chemical industry have been dedicated to public use by U. S. Steel Corp. of Del. and Carnegie-Illinois Steel Corp. The use of the material, which has emerged from the research laboratory and subsidiary companies of U. S. Steel since the end of the war, was patented by Dr. Marcus A. Grossmann, director of research, and Dr. R. F. Miller, development engineer, stainless and alloy steels, of Carnegie-Illinois.

Dr. Grossmann

Dr. Miller

The patent was issued recently to Drs. Grossmann and Miller and relates to "the use of a grade of steel particularly resistant to graphitization when subjected to stress in the temperature range from 800° to 1100°F." According to the patent, the steel developed and specified for this service is a carbon-molybdenum-chromium composition.

**Operations involving** ever higher temperatures have focused the attention of metallurgists and engineers on specific compositions best suited to give industrial equipment long life and more efficient performance. Oil refineries, chemical process plants and steam power generating plants are typical examples of industries concerned with the use of steel at high temperatures.

"Formerly plain carbon-molybdenum steel was considered completely safe for use in stress at temperatures up to about 1100°F since it was known to have ade-

quate creep strength within this range," according to the wording of United States patent No. 2,359,043, which describes the composition of the steel. Recently, however, it has been found that with prolonged use at elevated temperatures the carbon in the steel graphitizes so as to produce planes of weakness. . . . It is believed that this effect might prevail at temperatures as low as 850°F with adequate time, and it has been found definitely present at temperatures above 900°F."

**The steel embraced** in the patent now made available to public use is of the pearlitic, non-air-hardening type containing from 0.08 to 0.20 pct carbon and from 0.45 to 0.65 pct molybdenum in conjunction with from 0.15 to less than 1 pct chromium, which is proportioned with respect to the carbon content to fix substantially all the carbon in the form of carbide, which is stable within the defined temperature range, Dr. Grossmann said in describing the material.

## *Waste Elimination Is Price Ceiling Answer, Says Foundry Expert*

*Pittsburgh*

• • • **A. J. Edgar, technical** adviser of the Gray Iron Founders' Society, Inc., told members of the Pittsburgh Foundrymen's Assn., recently, that to meet competition from other industries, pay premium wages, and continue to operate under OPA price ceilings that will exist for some time, waste in the foundry must be eliminated. Mr. Edgar, trouble shooter for the society, said, in part:

**"According to basic** data supplied by War Production Board, the production of gray iron castings during the period January 1942, to June 1945, inclusive, totaled approximately 34,800,000 net tons. Peak gray iron production year of the war period, according to WPB data, was 1943, when output of finished casting totaled above 10,000,000 tons. The 2410 gray iron foundries with an annual capacity of 19,200,000 tons, in 1944, produced 9,700,000 tons, or little better than 50 pct of rated capacity. The below capacity operation of the industry throughout the war period was a reflection of the severe shortage of manpower—a consequence of the draft drain and losses to the "glamorized industries"—and the "unrealistic" price ceilings imposed on gray iron foundries by the Office of Price Administration.

"The shortage of gray iron castings is acute today and until the gray iron foundries can produce to the capacity of their 19,200,000 tons annually, many of the items we hope to purchase to make life a little more pleasant will be unproduced because of the need of the extra 9,200,000 tons of gray iron castings annually.

"Let's consider where waste is most likely to occur. As we are aware, waste is likely to occur in cupola operation, in coremaking, in molding, which involves gating and risering, in shakeout, and, finally, in the processing of castings through cleaning, grinding and shipment.

**"There has been endless** discussion of cupola operation, but nevertheless we must dwell on that subject to some extent since down through the ages cupolas have been operated by trial and error methods. To a considerable degree we are operating cupolas that way today. Actually, we are in the transition period of reducing trial and error data to scientific principles. The high spots of cupola operation in any foundry should emphasize the importance of the size of the materials, making up cupola fuel and metal charges. Even of greater importance is the accurate weighing of all the fuel and metal charges.

"I should like to emphasize the importance of absolute accuracy in the weighing of all the components of the cupola fuel and metal charge. The overall gray iron foundry industry does not do a very good job in weighing. In fact, it is unusual to find a foundry which is doing a weighing job equal to the quality of the materials it desires to produce. If you try to weigh cupola charge materials with the same accuracy used in weighing gold, you will acquire the proper mental approach to

weighing operations and quickly realize the benefits that accrue from this control.

"Consider coremaking and the waste that can be caused. There are hard cores, soft cores, wet cores, green cores, burned cores and ventless cores. The one big thing that causes more difficulty than anything else in core rooms is the utter disregard of control in the preparation of the core sand mixture.

**"Some foundries use** a scoop shovel to measure the sand; and sometimes the measure is full, and most times it is half full. Some people use a conventional wheelbarrow, sometimes full to overflowing and sometimes three-quarters full. The oil, cereal binders, etc., are measured in the same careless way. Such methods, it is obvious, cause bad cores and, ultimately, bad castings.

"It is simple to construct a sand measuring unit that can be struck off when level full to reasonably assure some control of the amount of sand used per batch. Cereal binders can and should be measured in containers kept in good repair. Oil is the most expensive of the raw materials used in core sand and should be measured very carefully and accurately, first to give the oil a chance to show what it can do and, secondly, to save a few pennies here and there.

"The next department where waste might occur and sometimes does is the molding department. Here there are many things to consider such as the skill of the men producing the molds, the condition of the sand, the control of the sand conditions, gating, risering, and pattern equipment. A casting can be no better than the pattern from which it is made, and there are very few artists or sculptors remaining in the foundry industry. Flask equipment, its condition of repair and the pouring temperature of the metal are also important factors.

**"The responsibility** of metal pouring temperature is usually left to the melting department, but many good ladles of iron have been spoiled by allowing them to cool down to the point that the molder thought best. Many times it is not the molder's superstitions either, because he knows that the sand given him will not stand the

proper pouring temperature for a particular casting.

**"On this point** of sand conditions, I have seen foundries where the sand is all bad and there is no hope of salvaging any part of it, yet the foundry will purchase all kinds of cure-alls to put into the heaps and systems, wasting money, time and causing additional scrap.

"The results of some sound research work that is now underway in one of the foremost laboratories in the country on some basic theories surrounding the production of gray iron castings will be interesting. Many theories have been accepted as gospel truth, but some developed facts have been startling. The work is underway at the Naval Research Laboratory, Anacostia Station, Washington, D. C., and has been undertaken at the suggestion of the technical committee of the society.

"The objective of good gating is to feed clean metal, quietly into the mold. Gates should be arranged to meet the following requirements: (1) They must not erode sand or trap air. (2) They must not be responsible for hot spots or shrinkage cavities. (3) They must be as easily removed as possible from the casting.

**"Some of the requirements** that a satisfactory rise must meet are: (1) The riser volume should be ample to compensate for the metal contraction within the area of the casting it is desired to feed. (2) The fluidity of the metal in the riser must be such that it can penetrate to the last contraction cavity within its sphere of influence. (3) The control of the rise with the casting must fully cover the area to be fed or be designed so that all the needed feed metal in the riser will pass into the casting. (4) The riser should be effective in establishing a pronounced temperature gradient within the casting.

"There are many things that could be discussed in connection with risers such as riser shape, height, contact with the casting, blind risers, combination of blind and open risers, and vents.

"In the shakeout gang a great deal of waste can occur through breakage and loss of castings, but the main fault found is in the preparation of the sand heaps at night in those shops that do not

have sand units. Molders claim that the sand is too wet or too dry, which usually means that the molder cuts his heap over. Conditions vary with the shop and types of sand used, but a portable water meter should be used and each shop should develop the amount of water required to bring the heap to temper.

"**Carelessness in shaking** out costs many thousands of dollars. Proper instruction and supervision alone can lower this figure. In the cleaning room waste is encountered because of breakage, carelessness on the part of grinders and chippers and lax supervision. Many times the equipment is in poor repair and time is wasted when a few dollars on repairs would pay for itself quickly. Then, there is the grinder who makes all kinds of figures on a casting with a hand grinder removing small bumps that do not effect the casting in any way, rather than start work on another casting. Also, there is the grinder who bears down too hard and cuts into castings, and the chipper who knocks of lugs and pads that are necessary parts of the casting.

"All of these items cause waste in the gray iron foundry and, while there are many legitimate excuses, the excuse of inexperienced help and low grade experienced help may become only an alibi if we adopt a good program of personnel policies and instruct supervision to give new employees sound courses of indoctrination. Those who are old hands accept the peculiarities and oddities of the industry as commonplace, but those new in the industry find the foundry a strange world, but if given the proper introduction, they reach the conclusion that a foundry is a good place to work."

## *Diamond Alkali Project*

*Pittsburgh*

• • • **A $400,000 plant and** warehouse will be built by Diamond Alkali Co., Pittsburgh, manufacturers of industrial alkalies, on a recently purchased 12-acre tract located at 69th St. and South Keeler Ave., Chicago.

A contract for the plant's construction has been placed with Rust Engineering Co., Pittsburgh. The project has been approved by the CPA and construction is expected to start in June.

## *Du Pont Develops New Lacquer Coating For Automotive Industry*

*Detroit*

• • • **Utilizing a** pigment never before employed in a lacquer finish—ferric hydroxide—and precipitating the pigment in smaller particle size than has heretofore been possible, Du Pont chemists have given the automobile industry a new high-lustre lacquer, Metalli-Chrome, that is the most durable yet developed, according to Robert T. Hucks, leader of the research team that carried out the experimental work.

Exposure in Florida to alternate sunlight and dew over a period of a year has failed to produce any appreciable change in color fastness and lustre of the new nitrocellulose lacquer. Passenger cars with a 4-yr road-tested coat of Metalli-Chrome are in excellent condition, although the cars received no polishing during the test period, it is reported.

The new lacquer finish is available, in quantity, for use on new cars and may be applied to refinish cars now in service.

The new coating was developed at the Du Pont laboratories in Parlin, N. J. which developed the original "Duco" in 1923. From the same laboratories the first translucent metallics were introduced in 1935; the metallic maroons and blues used on motor cars between 1937 and 1939 were a further development of the original translucent metallic finishes.

**The lustre of the new** finishes is a result of the high degree of translucency of Metalli-Chrome film. Light penetrates the film and is reflected back to the eye from within instead of from the outer surface of the film as it does when it strikes a conventional coating. The glowing effect is enhanced by small particles of aluminum flake which serve as tiny mirrors, diffusing and reflecting light from within the film.

Metalli-Chrome finishes represent a departure from the so-called metallic finishes which were popular before the war. A majority of the new colors were made possible, it was explained, by the new pigment material—ferric hydroxide—which has never before been used for this purpose.

## New Approved Dealers Licensed to Dispose Of Surplus Equipment

*Washington*

• • • **With 187 additional** "approved dealers" licensed during the last half of April to solicit and negotiate sales of government-owned machine tools and other production equipment, the number signed to expedite the WAA sales program totaled 1897 as of Apr. 30.

Another 112 dealer appointments had been made by regional WAA offices as of that date but the approvals and contracts had not been forwarded to Washington. In addition, a total of 336 dealer-agency applications was in process of screening and approval.

The appointments reported through Apr. 16 to 30, inclusive, were:

**BIRMINGHAM**

McVoy-Hausman Co., 2024 Sixth Ave. N, Birmingham
Birmingham Charcoal & Glass Co., 822 N 15th St., Birmingham
Charles W. Pooley, Jr., 1120 First National Bldg., Birmingham
American Saw Mill Machinery Co., 519 S 20th St., Birmingham
Industrial Machinery & Equipment Co., 2715 N 24th St., Birmingham
W. M. Smith & Co., 4601 First Ave., Birmingham

**BOSTON**

Arter Grinding Machine Co., 15 Sagamore Road, Worcester
Ban Norman Co., 3640 Main St., Springfield, Mass.
Crescent Corp., 26 Front St., Fall River, Mass.
Industries Outlet, 828 State St., New Haven, Conn.
The Clay-Klein Co., Inc., 76 Center St., Waterbury, Conn.
DoAll Boston Co., 89 Washington St., Brookline, Mass.
R. A. B. Heap, Lyme, Conn.
Charles W. Neff, 75 Bacon St., Waltham, Mass.
Richard S. Brown, Burleigh Road, Wilbraham, Mass.
Springfield Salvage Co., 1562 Main St., Springfield, Mass.
Lester W. Martin, Southington, Conn.
Eagle Machine & Tool Co., 417½ Fourth St., Pittsfield, Mass.

**CHARLOTTE**

R. G. Shouse, Jr., 56 Burke St., Winston-Salem, N. C.

**CHICAGO**

William F. Kueck, 1222 N Hays St., Oak Park, Ill.
Active Procurement Service, 5230 S Keating Ave., Chicago
Metal Clean Solvent Corp., 1444 W Randolph St., Chicago
Ternstrom & Swanson, 180 N Wacker Drive, Chicago
Metal Masters Co., 2346 W Diversey Ave., Chicago
A. G. Hansen, 435 W Vliet St., Milwaukee
R. L. Finkenstaedt, 231 S LaSalle St., Chicago
Thomas Connelly Co., 2310 Indiana Ave., Chicago
E. W. Soesbe & Co., 565 W Washington Blvd., Chicago

**CLEVELAND**

Universal Welder Corp., 735 Carnegie Ave., Cleveland
Chester J. Smitko, 13813 Beachwood Ave., Cleveland
Adams Engineering Co., 1969 E 119th St., Cleveland
G. C. Wood, 717 Liberty Ave., Pittsburgh

## NEWS OF INDUSTRY

Jack D. Long, 19765 Battersea Blvd., Rocky River, Ohio
Wyatt Sales Co., 314 Rockefeller Bldg, Cleveland
Lombard Corp., 338 W Federal St., Youngstown
Midwestern Sales, 1026 St. Clair Ave., Cleveland
Buckeye Machine & Supply Co., 819 N Howard St., Akron, Ohio
Factory Special Equipment, 3701 Bailey Ave., Cleveland
Edmund Burke Co., 3930 Drexel, Toledo
G-I Mill Supply Co., 467 Allwen Drive, Dayton
James P. Armel, 710 House Bldg., Pittsburgh
Stanley Berg & Co., 621 Frick Bldg., Pittsburgh
E. W. Smith Machinery Co., 521 N High St., Columbus, Ohio
John O. Morton, 37 Aurora St., Hudson, Ohio
Eric S. Sharpe, 740 S Negley Ave., Pittsburgh
George Fredric Arnold, 783 Union Commerce Bldg., Cleveland
Hovekamp Supply & Equipment Co., 1086 Bryden Road, Columbus, Ohio
Benkart Steel & Supply Co., 2017 Preble Ave., Pittsburgh
Henry P. Howe Co., 101 N High St., Columbus, Ohio
Harry W. Ruppel, 17821 Fernway Road, Shaker Heights, Ohio
Equipment Corp. of America, P.O. Box 933, Pittsburgh
Gibbs-Conner & Co., 2861 Detroit Ave., Cleveland
The Industrial Equipment Corp., 705 First National Bank Bldg., Pittsburgh
Ralph D. Lane, 302 Home Savings & Loan Bldg., Youngstown
D. M. Martin, 1129 Iliff Ave., Cincinnati
Kuhlman Machine Co., Norwalk, Ohio
The Elliott Electric Co., 2186 W 25th St., Cleveland
Beck Supply Co., 372 Dublein Ave., Columbus
Midwest Buff Mfg. Co., 2515 E 79th St., Cleveland
Robert F. Hrebek, 2287 Lalemont Road, University Heights, Ohio
Utilities Electrical Machinery Corp., National City Bank Bldg., Cleveland
A. R. Behl, 1237 E 146th St., E Cleveland
R. J. Bradley & Son, 488 E 105th St., Cleveland
Danber Distributing Co., 1137 Union Commerce Bldg., Cleveland
William Ehret, 16512 W Dale Ave., Cleveland
Parma Stamping & Die Co., 1515 St. Clair Ave., Cleveland
Zahn Equipment & Supply Co., 165 N High St., Columbus
Frank B. Foster, 829 Oliver Bldg., Pittsburgh
Paul J. Rennard, Fair Bldg., Oil City, Pa.
E. A. Mulson, 524 Greenhurst Drive, Pittsburgh
Franklin A. Maniatis, 1217½ State St., Steubenville, Ohio

### DALLAS

DoAll Dallas Co., 907 Second Ave., Dallas
Robert O. Burns, 1704 S Travis St., Sherman, Tex.
Service Supply Co., P.O. Box 485, Greggton, Tex.
Star Distributing Co., 403 N Ervay St., Dallas
J. J. O'Connell, Jr., 3417 Cornell Ave., Dallas

### DETROIT

Veterans Machinery Co., 5505 Chalmers, Detroit
Leonard A. Bernier, 6432 Cass Ave., Detroit
R. C. C. Co., 20201 Sherwood, Detroit
The Gear Grinding Machine Co., 3901 Christopher, Detroit
Louis M. Parine, 4505 Oakwood Blvd., Melvindale, Mich.
Esco Machinery Sales, 17031 Harper Ave., Detroit
Webster Mfg. & Engineering Co., 15319 Sussex, Detroit
James M. Wilkinson Machinery Co., 3321 Fenkell Ave., Detroit
J. Earl Associates, 2200 Olds Tower Bldg., Lansing, Mich.
A. E. Thorpe & Co., 13140 Filbert Ave., Detroit
William J. Van Raaphorst, 1231 Water St., Port Huron, Mich.
Mar-Quin Sales, 10967 Chelsea Ave., Detroit
L. E. Clarke & Sons, 6432 Cass Ave., Detroit
Jack A. Fisher, 1421 Delaware, Detroit
Ellis Manufacturers' Service, 7602 Burlingame Ave., Detroit
John McLachlan, 15516 Santa Rosa Drive, Detroit
L & M Engineering Sales, 950 Manistique, Detroit

### KANSAS CITY

Thomas Hill, 3632 Prospect Ave., Kansas City

Duke & Twachtman, 618 N Delaware St., Independence, Mo.
V. C. Wallar, Jr., 200 S Spring St., Camey, Kan.
Pittsburgh Distributing & Supply Co., P.O. Box 4, Pittsburg, Kan.
Brown-Strauss Corp., 1546 Guinotte, Kansas City
Langley Equipment Co., 907 McGee St., Kansas City
Kravetz-Barnett Co. and Barnett Fuel Co., 2401 Summit, Kansas City
Barr-Thorpe Electric Co., 2630 Holmes St., Kansas City
Eichenberg Machinery Co., 1512 Locust St., Kansas City
B. G. & J. Sales Co., 3627 Main St., Kansas City
General Steel Products Co., 2002 W Seventh, Joplin, Mo.

**LITTLE ROCK**

Blytheville Machine Shop, Blytheville, Ark.
Standard Equipment & Supply Co., 2600 E Sixth St., Little Rock, Ark.

**LOUISVILLE**

Andrew Cowan & Co., Inc., 421 W Main St., Louisville
Neill-LaVielle Supply Co., 505 W Main St., Louisville
Rolli Used Machinery, 546 E Market St., Louisville
Karl Nussbaum, 29th & Garland, Louisville
McCullough Machinery Co., 217 S Seventh St., Louisville
N. C. Frankel Machinery Co., 1212 Wilson Ave., Louisville
A. C. Walton, 216 S Shawnee Terrace, Louisville
H. B. Hines Co., Hardinsburg, Ky.
Progress Iron & Steel Co., 238 E Main St., Louisville
Falls City Machinery Co., 218 S Shelby St., Louisville
Oglesby & Simpson Supply Co., Inc., 432 E Broadway, Louisville
Graft-Pelle Co., 309 W Main St., Louisville

**NASHVILLE**

Engineering Sales Co., P.O. Box 446, Nashville, Tenn.
The Finn Equipment Co., Inc., 303 Scottish Ave., Knoxville, Tenn.
R. K. Haskew & Co., Inc., 1916 Dayton Blvd., Chattanooga, Tenn.
Pallett Mfg. Co., Inc., 517 N Gay St., Knoxville, Tenn.
Claude Smith, Jr., 707 Mississippi Ave., Chattanooga, Tenn.

**NEW ORLEANS**

Southern Machine Tool & Supply Co., 524 Poydras St., New Orleans

**NEW YORK**

Nichols-Morris Corp., 50 Church St., New York
DoAli Buffalo Co., Inc., 2325 Main St., Buffalo
Vincent J. Schneider, 192 Seventh Ave., New York
James Anderson, 54 Leslie Place, Irvington, N.J.

**PHILADELPHIA**

Allied Wholesalers, Inc., 3725 Midvale Ave., Philadelphia
Granite Machinery Co., 448 N 10th St., Philadelphia
Whiterock Quarries, Bellefonte, Pa.
Charles Dreifus Co., 12 S 12th St., Philadelphia
Joseph M. Crimmins, 226 E Jacoby St., Norristown
Techmatic Corp., Ridge & Crawford Sts., Philadelphia
Dana Tool D. Nast Machinery Co., 30 N Fifth St., Philadelphia
Tocaro Machinery Co., 110 N Sixth St., Philadelphia
Hub Tool Mfg. & Machine Co., 154 Walnut St., Reading, Pa.
Clarence R. Reck, 649 Frederick St., Hanover, Pa.
The General Procurement Co., Inc., 907 Colonial Bldg., Philadelphia
The Yale & Towne Mfg. Co. (Phila. Div.), 4530 Tacony St., Philadelphia
A-1 Industrial Equipment, 1202 Frankford Ave., Philadelphia
John Ramsay & Son, 513 N Madison Ave., Allentown, Pa.
J. H. Cohen & Son, 833 — 19th St., Altoona, Pa.
Jac-Lar Products Co., Inc., 120 N 32nd St., Philadelphia
R. W. Fuller, 19 St. James St., Mansfield, Pa.
Andrew N. Farnese, 714 Widener Bldg., Philadelphia
McGeehan Sales Equipment Automotive Co., 41 E. Diamond Ave., Hazleton, Pa.
Rosey's Auto Parts, Inc., 15 N Prince St., Lancaster, Pa.

R. E. Wood & Sons, Gash-Stull Bldg., Chester, Pa.
Lehigh Engineering Co., 1014 Deposit & Savings Bank Bldg., Wilkes-Barre, Pa.
John E. Miller, P.O. Box 598, Allentown, Pa.
Penn Auto Parts, 666 S Washington Ave., Scranton, Pa.
John Leafstrom, 21 S Fifth St., Philadelphia
Allen Tungate, 4624 Leiper St., Philadelphia
Valley Machinery Supply, 102 Tioga St., Sayre, Pa.
Do-All Reading Co., 34 S Fourth St., Reading, Pa.
Locomotive Crane Co., 519 N Delaware Ave., Philadelphia
W. Ross Stevens, 967 Green Terrace, Lancaster, Pa.
Baldwin Locomotive Works, Eddystone, Pa.
E. H. Mather Co., 3701 N Broad St., Philadelphia
Evans Machinery & Equipment Co., 770 S Schuylkill Ave., Philadelphia
G. A. Cotlar, Real Estate Trust Bldg., Philadelphia
Jos. F. McGovern, 515 Walnut St., Jenkintown, Pa.
Harry L. Magee, W Main St., Bloomsburg, Pa.
Aug. G. Gross, 3553 N Fifth St., Philadelphia
Leo A. Harding, 1625 Nay Aug Ave., Scranton, Pa.
The Bittenbender Co., 126 Franklin St., Scranton, Pa.
Wyoming Valley Equipment Co., Inc., 43 Owens St., Forty Fort, Wilkes-Barre, Pa.

**RICHMOND**

Chester P. Tinsley Co., 826 Fifth Ave., Huntington, W. Va.
U. S. Manufacturers' Bureau, Inc., 1536 Conn. Ave., Washington, D. C.
Nelson H. Carver, 102 W Leland St., Chevy Chase, Md.
Lawrence G. Murray, Sheraton Hotel, Washington, D. C.
C. Clayhill Associates, 3344½A Wakefield St., Arlington, Va.
Noonan & Bloomgren, 1508 H St., NW, Washington, D. C.
Arthur D. Samler, Inc., 219 W Pratt St., Baltimore
S. J. Meeks' Son, 622 G St., NW, Washington, D. C.
Walter Holt & Associates, 631 Pennsylvania Ave., NW, Washington, D. C.
A. F. Eves, Jr., Fountain Head Heights, Hagerstown, Md.
A. M. Kremkau, 934 Wayne Ave., Silver Springs, Md.
Kanawha Tool & Die Co., Inc., P.O. Box 3147, Charleston, W. Va.
James E. Bacon, 1317 New York Ave., NW, Washington, D. C.
Hamilton Sales & Service, 1119 Sixteenth St., NW, Huntington, W. Va.

**SPOKANE**

Yakima Hardware Co., 116 E. Yakima Ave., Yakima, Wash.
Andrews Equipment Service, 126 S Walnut, Spokane, Wash.
Gibson Welding Supplies, W 1009 Broadway, Spokane, Wash.
Bres Mining Equipment Co., Shoshone Bldg., Wallace, Idaho
Inter-Valley Equipment Co., Box 605, Yakima, Wash.

## *Inglis Plans New Foundry*

*Toronto*

• • • **J. E. Hahn,** president of John Inglis Co., announced that plans are in progress for the construction of a foundry specially designed and equipped for the production of the special castings required in certain of the regular lines of the Inglis Co. and those of its associate, the English Electric Co. of Canada, Ltd. The former government-owned Citadel Merchandising Co.'s warehouse at New Toronto, has been purchased for this purpose and arrangements also have been made for the acquisition of additional land adjacent to the building.

## Well Known Technical Men Appointed to New Council On Federal Specifications

*Washington*

• • • **Ten nationally** known technical and professional men have been appointed to the newly created Industry Advisory Council to the Federal Specifications Board by Treasury Secretary Fred M. Vinson.

Chosen for their outstanding contributions in the field of industrial standards and specifications, these men will assist in the development of Federal specifications which conform to government requirements and to industrial practice.

**Through establishment** of the Council, an effective medium is provided for bringing together the mutual interests of the government and industry and for keeping the government informed of new developments, improved practices and manufacturing processes, according to Secretary Vinson.

Howard Coonley has been appointed Chairman of the Council for a 1-yr term. Mr. Coonley is chairman of the executive committee of the American Standards Assn. and member of the board of the Walworth Co.

**Other members,** also serving at the Secretary's request, are: P. G. Agnew, vice president and secretary of the American Standards Assn.; Clarence L. Collens, chairman of the board of the Reliance Electric & Engineering Co., representing the National Electrical Manufacturers Assn.; L. A. Danse, chairman of the metallurgical committee of General Motors, representing the Society of Automotive Engineers; Vincent dePaul Goubeau, general purchasing agent and director of materials of the Radio Corp. of America; Clifford B. LePage, assistant secretary of the American Society of Mechanical Engineers; Harold S. Osborne, chief engineer of American Telephone & Telegraph Co.; Thomas Spooner, manager of the Engineering Laboratories and Standards Dept. of Westinghouse Electric Corp.; C. L. Warwick, secretary of the American Society for Testing Materials; and Warren N. Watson, secretary of the Manufacturing Chemists Assn.

# Johns-Manville Announces

# *Fifty Million Dollar*

**Multi-Million-Dollar "Test Tube"** for actual experimental factory production, as well as fundamental research, now under construction near Bound Brook, N. J. The Johns-Manville Center ultimately will include six large buildings. Innovations in the first unit include ten experimental factories under one roof; a movable rear wall to permit temporary or permanent additions, or to accommodate extra-large machinery; a special system of interior construction to provide flexibility to meet changing needs for laboratory facilities.



**Dr. C. F. Rassweiler,** Vice-Pres. of Johns-Manville Corporation in charge of research and development, states:

"We are living in an era of scientific improvement unparalleled in man's history. One single development stemming from social and economic needs can bring revolutionary changes throughout an industry. Today, we stand on the threshold of a new era, which has unlimited horizons for the development and improvement of new products for home and industry.

If this goal is to be achieved, some individual or group of individuals must have the imagination, courage and facilities to meet the challenge.

Johns-Manville has accepted this challenge and is now in the process of constructing the world's largest research laboratory devoted to service through science for better homes and greater industrial efficiency."

JOHNS-MANVILLE JM PRODUCTS

**Johns-Manville**